INFORMATION SYSTEMS PROGRAM

ANNUAL REPORT 1981

INPUT

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1 EXECUTIVE OVERVIEW

I EXECUTIVE OVERVIEW

- This report is produced by INPUT as part of the Management Planning Program in Information Systems. The report provides information stemming from both primary and secondary research on the information industry conducted by INPUT during 1981.

  - Primary research draws upon a survey of 240 Information Systems directors in 10 industry sectors.

  - Changes in the survey sampling and analysis techniques, as explained in Appendix A, imply that the data may not be directly comparable to previous reports in this series. Questions from clients on specific topics may be addressed to INPUT's New Jersey office.

A. EDP SPENDING

- Reported EDP spending rose an average of 16.7% from 1980 to 1981, as shown in Exhibit I-1. This increase is higher than the 11.8% that INPUT had forecast a year ago. In INPUT's opinion, besides sampling differences discussed in Appendix A, this reflects two major factors:

  - Early upward revisions in EDP spending plans, as signs of the U.S. economic recovery that began in the middle of 1980 became more

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EXHIBIT I-1

EDP BUDGET GROWTH

INDUSTRY SECTOR	AVERAGE 1980 BUDGET ($ millions)	ACTUAL INCREASE 1980-1981 (percent)	AVERAGE 1981 BUDGET ($ millions)	EXPECTED INCREASE 1981-1982 (percent)	AVERAGE 1982 BUDGET ($ millions)	EXPECTED INCREASE 1981-1982 ($ millions)
Discrete Manufacturing	$10.07	+19.1%	$11.99	+16.9%	$14.02	$2.03
Process Manufacturing	6.51	+16.6	7.59	+14.5	8.69	1.10
Transportation	9.92	+ 8.1	10.72	+ 9.2	11.71	0.99
Utilities	39.78	+21.2	48.23	+15.8	55.86	7.63
Banking/Finance	2.21	+17.2	2.59	+17.0	3.03	0.44
Insurance	2.51	+14.7	2.87	+11.8	3.21	0.34
Education	2.37	+ 5.5	2.50	+ 6.4	2.66	0.16
Distribution	4.61	+11.5	5.14	+12.3	5.77	0.63
Government	3.21	+10.6	3.55	+11.3	3.95	0.40
Service and Other	4.01	+12.7	4.52	+11.9	5.06	0.54
Average for all Sectors	$ 6.67	+16.7%	$ 7.79	+14.8%	$ 8.94	$1.05

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apparent. (However, many of these plans had to be hastily cut back in the third and fourth quarters of 1981.)

- Increased hardware delivery by all vendors, but primarily on the part of IBM, which had begun a dramatic expansion of its manufacturing capacity in 1979 (see INPUT's Vendor Watch Report, IBM Versus The New Competitors, April 1981).

- Information Systems (IS) directors participating in this year's panel anticipate continued good growth of 14.8% in 1982, but somewhat lower than reported from 1980 to 1981.

  - Considering that most replies reflected the economic conditions of mid-1981, rather than those prevailing at the end of the year, INPUT believes they should be interpreted as optimistic projections.

- Banking, discrete manufacturing, and utilities expect the greatest growth of 17.0%, 16.9% and 15.8% respectively.

  - Compared with last year's sample, discrete manufacturing and utilities remain among the three leading sectors, after having exceeded their 1981 objectives.

  - Banking has replaced transportation among the three fastest growers due to a change in the sample. The proportion of airlines in the transportation sample mix has increased, and as airlines' systems are more mature the rate at which their budgets are expanding is lower than for smaller transportation companies.

    . Moreover, the incremental data processing requirements imposed by demand deposit accounting for Negotiable Order of Withdrawal (NOW) accounts in the "thrifts" subsector, and increasing competition for retail banking business in the form of automated teller machines (ATMs), is expanding the data processing workload in the banking industry.

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- As in last year's sample, the education sector expects the smallest average budget increase while the utility sector forecasts the largest average increase.

  - Consistent with last year's report, these figures and all those shown in Exhibit I-1 represent simple arithmetic averages that can cover a wide range.

- Similarly, while there is no such thing as the "average" EDP budget, Exhibit I-2 presents a distribution of EDP expenditures that continues the trend of an increasing percentage to personnel, and a decreasing percentage to mainframes and other hardware.

B. VENDOR ACTIVITY

- Major product announcements by IBM in June and November 1980, coupled with a substantial reduction in third-party leasing activity, resulted in a resurgence of computer equipment purchases that is reflected in IBM's 17.8% gain in outright sales in the first half of 1981.

  - Expectations of an announcement of the "H" series, IBM's anticipated new price/performance line of large-scale systems, had been heightened as far back as 1979, causing some customers to shift to lease.

  - This shift was exacerbated by a sharp decline in purchases by third-party leasing companies after Lloyd's of London ceased insuring residual values of leasing companies' inventories in early 1979.

  - As a result, IBM's domestic CPU sales declined 11% in 1979 to $1.7 billion, while sales of all other data processing equipment rose by a historically moderate 8.5% to an estimated $1.235 billion.

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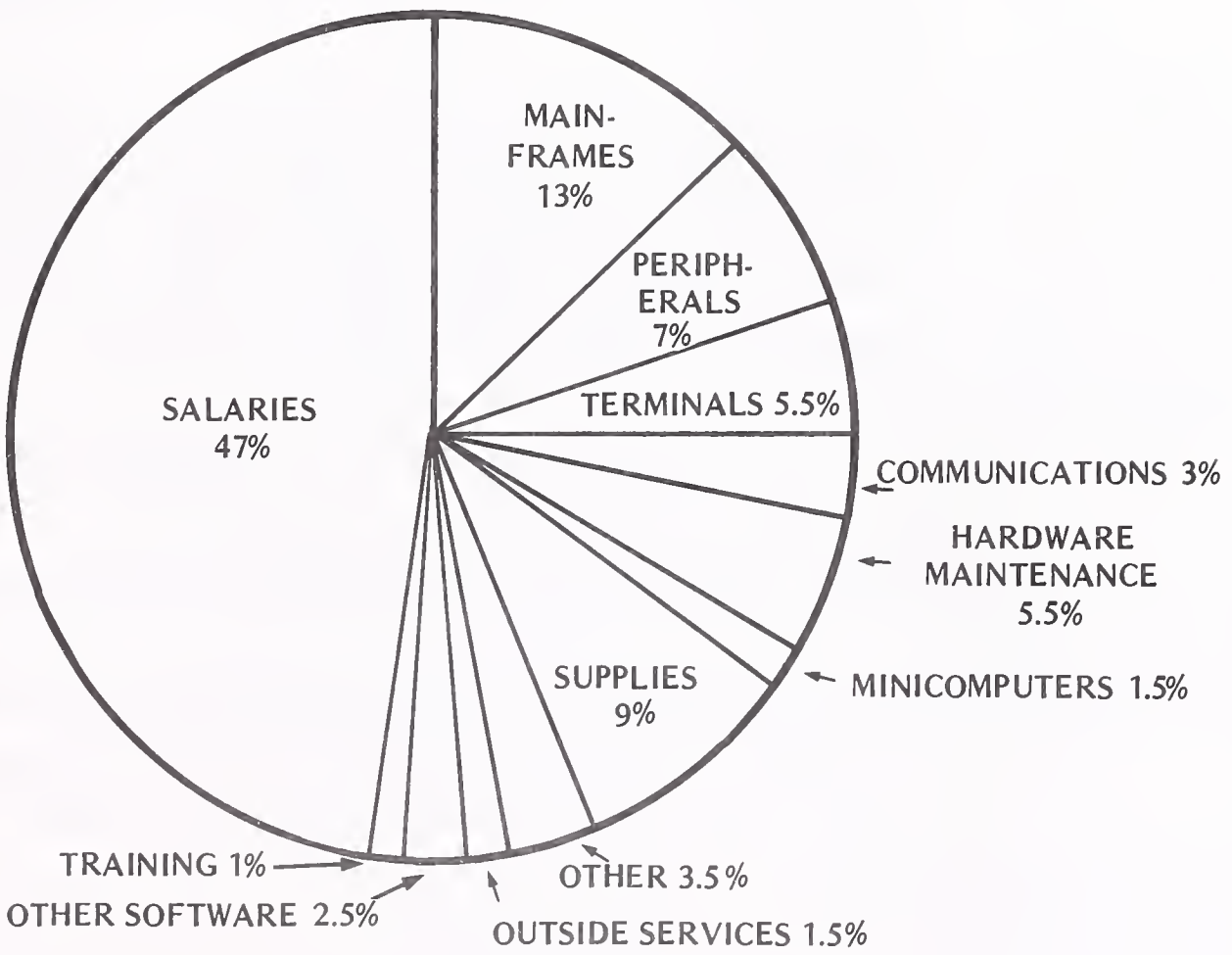
EXHIBIT I-2

DISTRIBUTION OF EDP EXPENDITURES IN ALL INDUSTRY SECTORS



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- By contrast, in 1980 IBM's domestic processor sales rose 17.7% to roughly $2 billion, and sales of peripheral and terminal products surged almost 30% to $1.6 billion.

- User confidence that the IBM 3000 series would not be rapidly obsoleted was likely bolstered in June 1980, when IBM management stated that the announcement of the 3042 attached processor, the 3375 and 3380 disk drives, a new switching management system, and enhancements to MVS and DOS/VSE, ". . . significantly extend the productivity of IBM's largest processors, providing our customers with the high-performance systems base they need for the expanding data processing requirements of the '80s."

- Further reinforcement was provided in the November 1980 announcement of the 3081, when IBM stated: "Our customers now have a wider range of powerful and compatible large systems options than ever before to meet applications growth in the '80s."

- Apart from the beneficial effects on IBM's future growth of this gradual transition from System/370 to the "H" series, users are faced with the pleasant prospect of a new era of stability with respect to hardware planning.

  - Rather than agonize over lease-versus-purchase decisions, users can be confident that equipment acquired today will be functioning as part of a larger, more sophisticated multiple-CPU complex several years from now.

C. EDP PLANS AND PROBLEMS

- Alleviation of concerns over the potential revolutionary impact of the "H" series on large-scale hardware planning leaves EDP management with two major problem areas, as evidenced by the responses of members of the 1981 Information Systems Director Panel.

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- Personnel recruiting, retention, and productivity concerns continue to occupy IS management, with no encouragement offered by demographic statistics. INPUT's research efforts remain dedicated toward exploring solutions to these problems.

- Development of long-range IS plans and objectives, and integrating them into the business objectives of the firm, are increasing dramatically in importance over the next few years as a concern of IS management. INPUT believes this is proper, if somewhat belated, as the value of high technology is lost if it is not meshed into the main activities of the firm.

- While the introduction of the personal computer into end-user departments is likely to work toward solving the problems of productivity and manpower shortages, the major risk is that applications development priorities may be set de facto by personnel outside the control of IS management, increasing the likelihood of unpleasant surprises to IS management as the ongoing value of the central IS organization begins to be questioned.

- IBM's announcement in August 1981 of its personal computer, following earlier announcements by Xerox and others, appears to INPUT to be both a partial solution of these problems, as well as a potentially serious control problem for IS management.

  - INPUT's analysis of the various personal computer announcements indicates that they are targeted, not at the computer hobbyist, but at the corporate employee who is not in the EDP department but who has some computer skills (or can develop them) and whose need for information services can potentially be satisfied by a small computer.

    . Such an employee's familiarity with specific applications substantially reduces the time spent on feasibility studies and systems design.

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- In particular, IBM's program distribution mechanism, and the promise of royalty income to authors of applications programs, is a powerful incentive that is likely to spur rapid applications development by non-EDP department personnel.

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II VENDOR ANALYSIS

II VENDOR ANALYSIS

A. OVERVIEW: THE QUIET REVOLUTION

- There have been few revolutionary events in the past year. There has, instead, been an ongoing evolution along many fronts that will, over time, have at least as significant an impact as individual "big news" events.

- One of the chief characteristics of what could be termed a "quiet revolution" is a gradual process, now beginning to pick up speed, that is dividing the old unitary world of systems into two new domains:

  - The "core."

  - The "periphery."

- This evolutionary process is acting on all parts of data processing, including:

  - Hardware.

  - Software.

  - Communications.

  - Data ownership.

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- The core/periphery concept is similar to the distributed data processing (DDP) concept in certain respects, but is much more extensive.

  - DDP usually focuses on linkages between a host and many nodes, or sometimes between equal-powered nodes of roughly similar size. There is a strongly implied dependency.

  - Equally important, DDP has been defined in so many different ways and in so many contexts that it has become illusory as an organizing principle.

- Exhibit II-1 illustrates the major differences between core systems and those on the periphery. Important points to keep in mind are:

  - Increasingly, many peripheral systems may operate totally separately from core systems.

  - The rising tide of personal computers, which will drive the separation, may threaten the viability of the core.

  - The core system has the difficult responsibility of deciding how much of the periphery should be knit together (conceptually and physically), and then of doing it. Both will become increasingly difficult issues.

- The core/periphery boundary is by no means an unchanging one.

  - Right now, for example, 4300 hardware is in many respects in the "core" camp. However, to the extent that it becomes completely stabilized (conceptually, a 4300-on-a-chip) then it could become functionally a very large personal computer.

  - The boundary is now fairly clear between packaged and one-of-a-kind software. "Application Generators" currently in their infancy are theoretically powerful ideas that would change this.

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EXHIBIT II-1

DISTINGUISHING FEATURES OF
CORE AND PERIPHERAL SYSTEMS

FEATURE	CORE SYSTEMS	PERIPHERAL SYSTEMS
Locus of Control	Central IS	User Department
Hardware Type	Large Traditional Mainframes; Large Mass Storage	Personal Computers; Terminals; Local (Small) Storage; Office Systems
Typical CPU Cost	Over $1 million	Under $10,000
Operations and Support Staff	Highly Skilled; Specialized	Moderately Skilled; Not Specialized
Communications	Inter-Departmental; Often Separate From IS	Intra-Departmental; Usually Not a Separate Function

(Continued)

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EXHIBIT II-1 (CONT.)

DISTINGUISHING FEATURES OF CORE AND PERIPHERAL SYSTEMS

FEATURE	CORE SYSTEMS	PERIPHERAL SYSTEMS
Packaged Software Cost	Often $10-100,000; Sometimes $100,000+	Often $100-500; Sometimes $1,000+
Maintenance (hardware)	On-site Service Calls Still Important	Depot Maintenance; Little Face to Face Service Contact
User Interaction with System (Hardware, Software)	Usually Indirect (via IS Staff)	Usually Direct
Overall System Complexity	High; Becoming Higher	Moderate; Stabilizing

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  - Decision support system packages (modeling languages and fourth generation languages) are already being used by users for applications that would have been custom-built only a short time ago.

- Office automation now means word processors, perhaps linked in some primitive way. Such systems, perhaps with equally primitive computational ability, are on the periphery of the periphery.

  - However, self-contained office-of-the-future nodes that are self-contained and paperless would be the building blocks for considerably different kinds of computer systems than we know now.

- Videodisks, necessary for the office-of-the-future, would also enable the periphery to handle much more work than would be possible now.

- For many functions, peripheral systems will become very attractive low-cost, high-return alternatives to traditional systems.

  - Hardware costs are already low.

  - Labor is "free" (i.e., the time a professional formerly spent on telling the EDP staff what was wanted, can instead be spent on doing it).

  - Software is constantly improving.

  - For example, many types of modeling and financial planning can be done as satisfactorally by small computer-based packages as by time-shared software on large machines. The cost on the smaller system can be many times less expensive.

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- Core systems will be left with high-cost functions, as shown in Exhibit II-2. The challenge for IS management is to identify high-benefit applications that can be accomplished more suitably by the core.

  - Examples would include such undertakings as:

    . True corporate data bases.

    . Very large data bases and/or very high compute-bound analytic jobs that are used irregularly.

    . Corporate communication networks.

    . Office of the future applications crossing corporate political boundaries.

  - Feasibility studies for core applications will have to be of very high quality so that real benefits are correctly quantified. Stakes will become ever higher.

- In the remainder of this chapter, INPUT will review highlights of events over the past year in the "quiet revolution." Many of the events will be vendor announcements or actions, since, increasingly for better or worse, the vendors usually set the pace or make change possible in the industry. The days when an industrial firm's IS department would itself decide to develop a data base management system (or the equivalent) seem gone forever.

- By and large, IBM's competitors in the equipment marketplace seem to be recognizing that despite its size IBM cannot satisfy users' needs completely, and that a piece of the IBM marketplace is better than no market share.

  - Thus, an IBM interface of some kind, whether it be an emulation capability, protocol support, or full plug compatibility, tends to be a major design consideration for any product offering.

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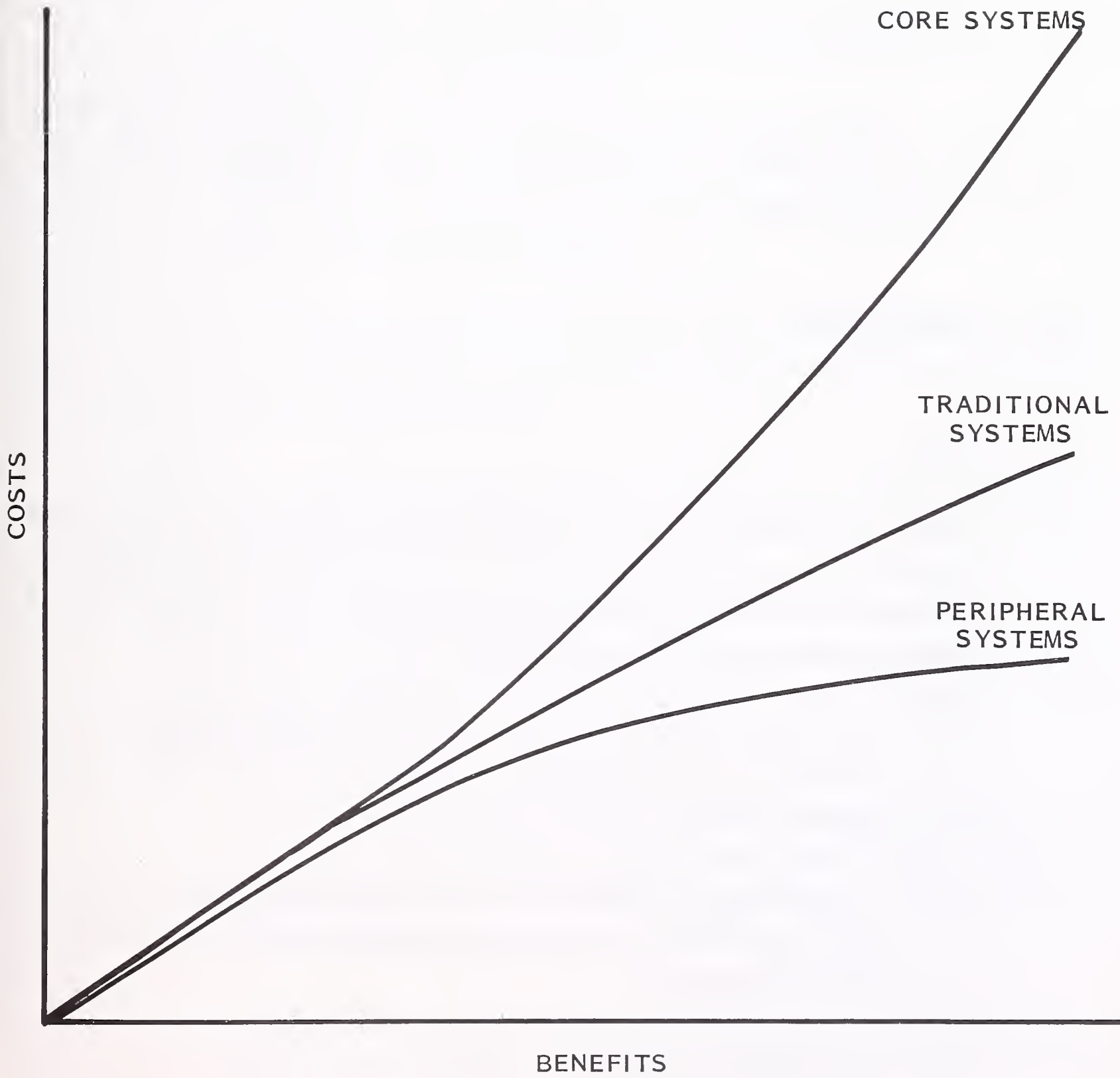
EXHIBIT II-2

COST/BENEFIT RELATIONSHIPS
OF DIFFERENT SYSTEM TYPES



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- INPUT believes that the proliferation of competitive offerings is healthy for the industry. It is also beneficial to users in that all vendors must equal or exceed the price/performance, reliability, and ease of use of IBM hardware in order to survive over the longer term.

- The convergence of these various influences, in INPUT's opinion, is working to provide information systems management with greater opportunities to truly manage, and to devote more time to, strategic issues rather than to reacting to immediate changes to data processing requirements.

  - These greater opportunities also entail a different set of risks, which can largely be controlled by being well informed on corporate and technological issues.

B. MAINFRAMES

1. IBM

- IBM finally announced the first member of the "H" series, the 3081 Model Group D. It is a water-cooled dual processor system packaged as a single unit, priced at $3.7 million for the basic configuration. The system is rated at approximately twice the power of a 3033U.

  - The "dyadic" nature of the system means that two processors, each with its own set of channels, share main processor storage under a single operating system.

  - The 3081 did not initially stir much enthusiasm, being viewed as a logical extension of the 3XXX line, offering expected price/performance improvements.

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- The impact of the announcement was nothing like that of the 4300 series, since the 4300 offered striking price/performance improvements and gave system builders new options for hardware placement.

- Shortly after the "H" announcement, IBM introduced the Model 3033 Group S processor for $1.1 million. The new system offers 4300 users a path to IBM's larger mainframes.

- The 4300 continues to be extraordinarily popular, often ordered by the dozens and sometimes in even larger quantities.

  - Many firms view the 4300 as a way of distributing processing power throughout an organization without having to absorb foreign architecture or having to modify software.

  - In many cases this approach has made sense and worked well. In others, however, it forces on users operating system complexities and unwieldy or "user-hostile" software.

  - The 4300 is a very useful tool, but cannot always compete with personal computers for either convenience or economics.

- INPUT believes that large IBM systems of the future will be modular combinations of central processors, with varying configurations of shared and private main storage and peripherals, operating under MVS/SP JES 2 and MVS/SP JES 3.

  - The IBM 3042 Attached Processor Model 2 provides the large system user with channel capacity expansion requirements and the option of configuring an attached processor complex as an alternative to a multiprocessor configuration.

  - The IBM 3081 Processor Complex consists of a 3081 processor controller and two dyadic processors in the 3082 processing unit. The

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dyadic 3082 processors differ from tightly coupled multiprocessors in that channel affinity is not static; i.e., any and all channels normally connected to one processor can be dynamically reassigned to the other.

- The IBM 3814 Switching Management System permits the switching of peripheral devices among processors either dynamically or under stored program control. This improves system reliability in complex configurations by automating the power-down and power-up sequences of components in a "cannot-fail" environment.

- For example, MVS/SP JES 3 is currently designed to support up to 32 logical processors. In recognition of these requirements, the IBM 3814 can reconfigure a system under stored program control to any of a maximum of 78 prestored configurations.

2. IBM COMPATIBLES

- The IBM compatible manufacturers continue to match IBM announcement for announcement and to fill in their product lines.

- Reacting quickly to IBM's announcement of the first member of the long-anticipated "H" series (3081), Amdahl Corporation announced two new systems, the 580 line and the 470V/7C.

  - With the 580 line, Amdahl is offering both uniprocessor and dual processor configurations. Priced at $3.8 million, the Amdahl Model 5860 uniprocessor offers twice the processing power of a 470V/8 or 30% more than IBM's 3081. Initial shipments are scheduled for April 1982. The 5880 dual processor model, priced at $7.5 million, offers 3.5 times the power of Amdahl's 470V/8 and handles up to 36 I/O channels. Delivery is scheduled for the second quarter of 1983.

  - At the same time as the H-competitor announcement, Amdahl also introduced the 470V/7C, an entry level machine for the Amdahl line,

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priced at $1 million. The 470/7C has 4MB of memory and eight I/O channels.

- National Advanced Systems entered the IBM 3081 compatible market with the introduction of a Dual Processor (DPC) version of the AS/9000 announced last September. The new system offers 70-90% greater computing power than a single AS/9000 and is basically two AS/9000 uniprocessors in a tightly coupled configuration. A minimum AS/9000 DPC system with 16MB of memory and 16 channels was listed at $5.5 million.

- At the low end of its IBM compatible line NAS introduced the AS/5000N and AS/5000E IBM compatible processors. Price/performance ratios of both models are similar to those of IBM's 4341 line.

- Also at the 43XX level, IPL Systems has announced a Model 4436 processor which is plug compatible with IBM's 4341 Group 2 system. A 2M-byte version costs $330,000 which is approximately $50,000 less than a comparably equipped IBM model.

- Shortly after IBM's announcement of the 4341 Group 2 computer, Magnuson unveiled yet another member of its M80 family, the M80/44. The new Magnuson system matchs the 4341-2 in performance, but costs about $90,000 less. It provides about 70% more processing power than an IBM 4341-1, at about 12% more cost.

- There are three new entrants on the IBM-compatible scene.

  - The Nixdorf Computer Company announced the Model 8890, a 4331 Group 2 compatible system. It was initially available only in Europe; however U.S. shipments are scheduled to begin in the fourth quarter of 1981. The 8890 is a multiprocessing system with 12 partitions and virtual storage capability.

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. The new unit utilizes an independent but fully IBM compatible operating system - a system obtained through Nixdorf's acquisition of the Computer Software Company in May 1980.

- Proceeding with plans to build its own plug-compatible processors, Storage Technology (STC) recently formed STC Computer Research. The new company is a limited partnership, the main purpose of which is to develop IBM compatible systems.

- Trilogy Systems is the name of a new computer company established late in 1980 by Amdahl Corporation founder, Gene Amdahl and his son Carl Amdahl (co-founder of Magnuson Computer Systems). Although the firm's first product will not be ready until 1985, Amdahl has said that it will be targeted at both the general purpose and scientific markets, and will compete with IBM's H series.

- A purchaser can decide to "stay IBM" and yet be able to choose from quite a wide selection of competitive equipment. Why haven't more done so? Reasons include:

  - The IBM security blanket (yes, even in the 1980s).

  - IBM pressure (yes, Big Blue can still be quite testy with top management).

  - IBM support (not quite what it used to be, but better than the competition; no real choice for firms needing national coverage).

  - The question of the staying power of compatibles: Is brand X compatible on all levels? Will it be backward compatible with IBM's next generation?

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- Since the IBM world is now so pervasive, a logical question is whether the "BUNCH" (Burroughs, Univac, NCR, CDC, Honeywell) will ever "accept the IBM reality" and offer at least one line of IBM-compatible hardware.

  - CDC is in an especially tempting and sensitive position since it offers a fairly full line of IBM-compatible peripheral hardware; a complementary CPU would be logical. CDC recently had to publicly deny it had such plans.

  - The posture of other manufacturers is regularly discussed within the industry.

  - In some cases (e.g., Burroughs) there are deep organizational biases against changing to what they might characterize as an inferior architecture.

  - For all competitors, there are fundamental marketing reasons to ponder long and hard: current customers could well believe they were being abandoned and might jump ship.

    . Because of this, any of the "BUNCH" that did, at least partially, ofter IBM compatibility would try to do so in a way that reaffirmed their commitment to existing customers and architecture (as well as in a way that prevented easy migration from their current architecture to the IBM architecture).

3. IBM MAINFRAME COMPETITORS

- The "BUNCH" have also made incremental additions to their product lines.

  - Many of them will be watching with some trepidation the "MIPS" race between the 3081, its compatibles, and the Japanese.

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. If, in fact, 3081-type installations have significant performance advantages over uncoupled or loosely coupled CPUs, then some of the other manufacturers and their customers may be at a distinct disadvantage.

- In an attempt to improve its sagging profits, Burroughs Corporation directors elected W. Michael Blumenthal chief executive of the firm, three months earlier than originally planned.

  - In late September 1980, Burroughs introduced the B 5930, the seventh series of computer systems in the B 900 family. The B 5930, which is positioned between the IBM 4331 and 4341, is intended to be the entry level system to large-scale data processing usage. Purchase price of the basic system is $200,000.

  - Burroughs also announced that the firm intends to release two additional "900 series" systems - the B 4900 and B 7900 in order to complete the restructuring of the entire Burroughs Computer lineup to take advantage of the new 900 family technology.

- Sperry Univac has added two new uniprocessors to its 1100/60 family of computers.

  - Just one month after the IBM price increase announcement, Sperry advised its customers of selective increases in rental, lease, and purchase prices from 5% to 15%. Maintenance prices were also increased at this time, by 9%.

- The first shipments of NCR's top end processor family, the 8600 series, which had initially been announced more than two years ago, have been rescheduled for late 1981. Like the NAS AS/9000 line, the 8600 comes in two models, the uniprocessor V-8650 and a dual processor V-8670 which is claimed to perform in the same range as IBM's 3032 and 3033.

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- Both new NCR systems use 64K RAM memory chips. Although there had initially been a problem in obtaining the 64K components, the problems appear to have been solved. Problems have developed, however, in acquiring 100K ECL logic circuits.

- Almost a year to the day after announcing its large-scale DPS 8 series of mainframes, Honeywell added two more models, the DPS 8/62 and the dual processor DPS 8/44D. The DPS 8/62, which was listed at $759,000 offers about 30% more processing power than the DPS 8/52 and is comparable in performance to the IBM 4341-2. The dual processor DPS 8/44D, priced at $424,000, reflects Honeywell's commitment to multiple processor configurations.

4. THE JAPANESE

- The Japanese have been strangely quiet in the American market in spite of (possibly because of) much activity in Japan.

- Fujitsu Ltd. announced the development of two computers, the Facom M380 and M382, which, it claims, have the world's largest memory capacity and fastest data processing speed.

  - According to Fujitsu sources, the Facom M382 dual processor system offers four times as much memory as the IBM 3081 and supplies 2.7 times the data processing speed of the IBM machines.

  - Fujitsu also claims that both its new supercomputers are smaller and use less electricity than conventional computers.

  - A spokesman for Amdahl Corporation, in which Fujitsu holds a 32% interest, has said that the new Fujitsu computers are built from some of the same jointly developed hardware technology used in the Amdahl 580 series. Neither of the systems will be available to U.S. users, because of agreements between Fujitsu and Amdahl.

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- Hitachi has also developed a top-of-the-line processor, the M-280H. Its processing speed is, reportedly, 11 MIPS which is about 12% better than that of the IBM 3081. The M-280H has a maximum memory of 32 megabytes and up to 32 channels. A minimum configuration with eight 2.52 gigabyte drives was slated to rent for $193,000 a month.

- The Japanese are still consolidating their position at home and are planning a strategy for entering the U.S. market.

  - The "Trojan Horse" strategy (e.g., having NAS sell Japanese equipment) offers limited market penetration and product potential.

  - Any IBM-compatible strategy condemns them to be followers and perhaps, get no more of the market than the other compatibles.

  - The high-risk/high-return option is to break away from IBM operating systems and offer an efficient, easy to use host environment. This should be technically feasible, since IBM OS is encrusted with almost 20 years of "improvement," but:

    . Can the Japanese do it?

    . Will EDP shops give up the IBM security blanket they love to hate?

C. MINICOMPUTERS

1. OVERVIEW

- The traditional 16-bit minicomputer market is steadily shrinking as super-micros nibble away at its boundaries from the bottom and superminis do likewise from the top.

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- Several vendors have joined the 32-bit foray this year with either new 32-bit products, or enhancements to earlier offerings. DEC, Four-Phase, Harris, Honeywell, and Perkin Elmer have all released 32-bit systems. Even Tandem's Non-Stop II, while not strictly a 32-bit system, incorporates 32-bit data access architecture.

- Most of the other minicomputer offerings announced this year have simply been enhancements to older systems. Data General's additions to the MV/8000 line and IBM's enhancements of its 8100 line and its System 38 exemplify this trend.

- There have been a few traditional 16-bit offerings as well. Datapoint's 8800 system, Inforex System 9000, and Honeywell's DPS 6 line are typical examples.

- IBM's personal computer represents the most direct challenge at the bottom end, in its use of the Intel 8088 microprocessor which has 8-bit logic, but includes a 16-bit address facility. This opens the door to a significant body of existing software, and is a precursor of the squeeze that will inceasingly occur in the standard minicomputer category.

• Data General has undergone a major corporate reorganization this year, a reorganization aimed at streamlining decision-making and repositioning the company for continued growth in the 1980s.

  - Three separate business divisions have been formed. Planning, product development, and marketing have been consolidated by product group rather than functional corporate areas. The three new product areas include: the Information System Division, which sells large systems to large businesses, the Small Business System Division, which markets microcomputers to individuals and small businesses; and a Technical Products Division, which markets computers to industrial companies.

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- As a result of Data General's declining stock prices, the company's proposed acquisition of Megatek, the California graphics and hardware vendor, was canceled.

2. NEW ENTRANTS

- Just ten months after founding Apollo Computer Corporation, William Poduska unveiled the company's first product - Domain, a 32-bit minicomputer designed to be configured as a series of computational nodes in a locally distributed network. Initially the system will be targeted at scientific and engineering users.

  - The Domain system incorporates a number of minicomputers that can be used to swap data back and forth, send messages, and interact over a coaxial communication network. Users in the several node system can access data from a particular system without suffering any performance degradation.

  - A typical system would have 10 to 20 computational nodes, but users can - according to Apollo sources - link up to 200 nodes without any performance degradation.

  - The system's computational node costs $24,000; Winchester and floppy disk expansions add another $10,000 per node.

- The TRW-Fujitsu team (TFC) has introduced its first computer system, the V-830/850 family, to U.S. users. The new system is targeted at both the first-time user and large companies needing distributed processing capabilities. Prices range from $25,000 to $200,000.

  - The joint venture of TRW and Fujitsu is 51% owned by the Japanese and 49% by TRW. The V-830 represents the low end of the minicomputer line offered by TFC. The largest system will be driven by the 32-bit V-850, which has, up until now, been available only in Japan.

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3. NEW PRODUCTS

- Datapoint has unveiled a new top-end processor for its DATASHARE and ARC systems. The 8800 uses a 16-bit word CPU and can support 256K- to 1,024K-bytes of main memory and 202M- to 1,012M-bytes of disk storage. The 8800 system, which runs under a new operating system called the Resource Management System (RMS), can function as a data resource on the ARC system, as a standalone system, or as an applications processor on ARC.

  - Datapoint has recently announced plans to acquire TRW's international sales and distribution network in ten countries. This acquisition would provide Datapoint with a direct sales force, both in the U.S. and abroad.

  - In September 1981, Datapoint and Tandy jointly announced an add-on facility that allows TRS-80s to be attached to ARCnet, while ARCnet processors can be linked via TRS-80's bisynchronous software to IBM, DEC, and certain other processors.

- Digital Equipment Corporation (DEC) finally announced its long-awaited VAX 11/750 in October of 1980. The new "Baby" Vax is the first 32-bit computer to use custom gate array technology. It is fully software-compatible with the more powerful VAX 11/780 and uses the VAX/VMS operating system. The basic VAX 11/750 costs $47,000; larger systems with a full array of peripherals range from $89,000 to $120,000.

  - DEC also introduced the PDP 11/24 system, which is an entry level member of the PDP/11 family. It has twice the memory and performance of the older level PDP 11/04, but costs only 30% more. Prices begin at $11,000.

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- Hewlett-Packard (HP) extended its HP3000 line with the addition of the Series 44 model. HP claims that it offers twice the throughput of the previous top of the line Series III. A minimum configuration of the HP 3000 Model 44 costs $109,445.

  - One of the key features of the new system is the Guaranteed Uptime Maintenance Option. Under this plan, performance of the core of the system - processor, main memory, and one or two disk units - is evaluated monthly. If, during a three-month period, the core system was not up 99% of the time, HP promises to give the user credit for a month's maintenance. The option is available at a 7.1% premium over the fee for normal full-time maintenance.

  - Interestingly, many users report the guarantee is not worth paying the additional premium, because the system routinely delivers more than 99% uptime with normal maintenance.

- On December 2, 1980, Honeywell announced a new family of ten small computers, the DPS 6, which feature both 16-bit and 32-bit systems. Honeywell has claimed that the DPS 6 is the first 16-bit computer that can be field upgraded to a 32-bit processor.

4. ENHANCEMENTS

- Virtually every manufacturer announced enhanced minicomputer products.

- Perkin Elmer extended its family of 32-bit minicomputers this past spring with its announcement of the 3230, which supports up to 8M-bytes of main memory. The system reportedly offers 94% of the power of the DEC VAX 11/780 at approximately 30% less cost. The unit can support 128 on-line terminals in a typical transaction processing arrangement.

  - In addition, remote diagnostic capability provides the user with total hardware and software control of the system.

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- Tandem Computers extended its hardware architecture with the addition of a second major product - a transaction processing system that represents the second generation of systems designed for continuous operation and data integrity.

  - Although not strictly a 32-bit system, the firm's latest offering, designated Non-Stop II, incorporates a 32-bit data access architecture and provides users with a virtual addressing space of one gigabyte per processor and 16G-bytes per system.

- IBM announced a series of enhancements to the 8100, Series 1, and System/38.

  - Among other things, the System/23 (Datamaster) now provides a low-end entry to the System/38.

- Other manufacturers announcing enhancements included:

  - Sperry-Univac, with new V77 models.

  - NCR, which replaced the I-8000 with the I-9000.

  - Four-Phase, which introduced upgraded models IV/80 and IV/94.

  - Data General, which enhanced the MV-8000.

D. PERSONAL COMPUTERS/OFFICE AUTOMATION PRODUCTS

1. OVERVIEW

- As has been stated in previous annual reports, it has become extremely difficult to distinguish between minicomputers, large microcomputers, small business computers, and personal computers. Terminology and technology are

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both in a state of flux at this time. Whereas 8-bit micros, 16-bit minis, and 32-bit mainframes once served as the industry standard, 32-bit microprocessors are now common.

- In addition, the lines are blurring between "computers" and "word processors," with "workstation" becoming an increasingly popular phrase and concept.

- Competition is increasing, with microcomputer system suppliers stepping up pressure at the low end, vying against both traditional small business vendors and mainframe manufacturers.

  - The pressure at the low end has begun by the change in focus of companies like Tandy and Apple from the hobbyist market to the business environment. The IBM and Xerox entries will redouble this pressure.

  - Japanese manufacturers have also begun to make inroads into the U.S. market. NEC's product line is geared to the low end of the market, while TRW-Fujitsu's systems are aimed at the high end of the small systems market.

- The entry of well-known names (IBM, Xerox, DEC, HP) into the personal computer market, promises to place the sale of approval on what used to be thought of as "toys."

- IBM's actions are of special interest, given IBM's size and the importance of large-scale data processing to it.

- The trend of product announcements made by IBM since October 1978 (when the IBM 8100 was introduced), and the IBM internal reorganization announced in October 1981 indicate that IBM will be bringing its considerable resources to bear, in much more focused fashion, upon the extension of corporate

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information systems support to the automation of office information-handling functions.

2. PERSONAL COMPUTERS

- In the personal computer area, vendors appear to recognize that, as a result of education trends over the past decade, a growing number of office workers today and over the next several years have had, or will have, some exposure to computers and the BASIC programming language during their high school - and, in some cases, elementary school - years.

  - The thrust of the personal computer vendors' approach to office automation markets depends on corporate acceptance of personal computers that are programmed and ued by non-data processing personnel. IBM's entry into the personal computer marketplace appears very likely to encourage this acceptance.

  - INPUT views recent moves by IBM and Burroughs to distribute applications programs written by nonvendor employees as an effective vehicle to ease any lingering concerns over using software not developed within a specific user's data processing organization. These actions will probably tend to ease the burden of applications development, or at least shift this burden away from the information systems department, thus permitting information systems personnel to concentrate more effectively on solutions to corporate systems problems.

- A number of other manufacturers besides the "Big Four" introduced small computer systems. Prices vary considerably and it is by no means clear if price and performance are always related. Examples of recent product introductions:

  - Hewlett-Packard has mounted an aggressive attack on the small business systems market by establishing a dedicated OEM sales force for its HP 250 small business system and by increasing the discount to

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OEMs by up to 10%. In addition, HP added new capabilities to its 250 small business computer, including larger add-on memory, new Intelligent Network, and remote job entry (RJE) software for data communications to HP, IBM, and other computer systems, and a new facility to read and write IBM 3741-formatted flexible disks.

. As further evidence of its growing commitment to the office-of-the-future market, HP recently brought out a $2,250 desktop "personal" computer aimed at business executives and technical professionals.

- The Apple III computer, the highly ballyhooed successor to Apple II, was announced last May with much fanfare. Deliveries were scheduled to begin in December 1980, but volume sales did not begin until March 1981 and even then the new system was plagued by technical and mechanical problems.

. The company's troubles with the Apple III line have been attributed to a number of factors, including both the company's meteoric growth and the firing of 40 employees.

. In the face of mounting concern about the fate of the new system, Apple recently assured its dealers that it has no plans to phase out the Apple III, and in fact reintroduced it.

- The recently formed System Division of ADDS has introduced a small business system called Mentor that is software compatible with the Microdata Corporation Reality minicomputer. The new system sells for $30,000 to $50,000 and provides users with both an entry level system and a migratory path to other Reality-compatible machines.

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. ADDS is offering an advanced operating system developed by Pick Computer Works with Mentor. The system provides data base management features needed for an interactive system that is easily accessible to non-data-processing employees.

- In a very interesting move, DEC is now offering a plug-in circuit that converts its VT100 display consoles into a CP/M compatible micro-computer system.

. The cost is $2,400 including two floppy disk drives.

3. WORD PROCESSORS/MANAGERIAL WORKSTATIONS

- The term "managerial workstation" has begun to appear in the computer field's technical and sales literature. Although these new systems tend to resemble terminals, they may soon represent the heart of the office automation market.

- When IBM announced its Displaywriter last year, there were predictions that competition would soon be forthcoming. Within 12 months Wang came up with its Wangwriter and Xerox introduced a combination word processor and personal computer - at a significantly lower cost than the IBM system.

- Then, in August, IBM came back with its personal computer, which also has word processing capabilities, at a similar price level.

- The Wangwriter, a standalone unit costing $6,400 is designed for individual applications within corporate environments and provides the potential for upgrade, positioning it as an element in (Wang's) overall automation strategy.

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- Data General has focused attention on the office automation market by releasing the MPT/80, 83, and 87 family of micro-Nova-based intelligent workstations that are software compatible with Data General's full CPU line. The MPT family includes a 16-bit microcomputer with 60K-bytes of local RAM and up to 716K-bytes of minidiskette storage in a desktop keyboard/display unit. Prices for the MPT line range from $4,800 to $7,100.

- In an effort to gain a firm foothold in the growing office automation market, Burroughs combined the Products group of recently acquired SDC with its Office Automation division and created the Office System Group. One of the first announcements from the new group was the RM III entry level word processing system, aimed at the IBM Displaywriter and Wangwriter markets.

- Honeywell has labeled its word processor offering the "Infowriter" and is pricing it at $8,395, including an NEC Spinwriter printer. The Infowriter can function either as a standalone unit or as part of an office network. Its Office Automation System Software was especially designed for the system and allows it to support document processing along with electronic mail and records processing.

- Xerox's professional workstation, the Star 8101 incorporates computing, text editing, graphics creation, and communications functions. The basic workstation includes a split-screen desk-top display, an 8000S processor, a 10M-byte Winchester disk, and a pointing device called a "mouse." To execute most of the system's functions, the user moves the mouse to point at one of the symbols that appear on the screen; the symbols resemble traditional office equipment like filing cabinets and in/out trays. The system can also produce graphic shapes, grids, frames, and lines, all of which can be moved or enlarged on the screen. The basic Star system carries a single unit price of $16,595.

  - Price is commensurate with performance. However, an open question is the extent to which organizations can take advantage of the high performance.

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4. MULTIFUNCTION PROCESSORS

- Increasingly, products are being developed and marketed both as small computers and as word processors/workstations. The boundaries are unclear and depend as much on vendor claims as anything else. INPUT expects that in the near future most small processors will be labeled multifunction processors.

- Recently announced products which fall into the multifunction category include the following:

  - Xerox's 820 information processor serves as both a personal computer and a word processor depending on software configuration. Either way, the system is aggressively priced: as a personal computer, the 64K-byte 820 is listed at $2,995 with quantity discounts of up to 40% available; as a word processor, the 820 also includes a Diablo 630 printer, priced at $2,900, and word processing software for $500. The total cost of $6,395 brings the 820 below the cost of either the Display-Writer or the Wangwriter.

  - In response to the Xerox 820 announcement, Wang subsequently cut the single unit price of the Wangwriter by 15%, thereby bringing the price down to $6,400, and disclosed plans to market the product through retail outlets. Wang also announced the availability of CP/M for the machine.

- Start-up vendor Convergent Technologies has introduced a multifunction workstation line of computers. Cluster configurations allow several stations to share peripherals, but not processing power.

  - Each station executes its own interactive application program so that computational power and a high level of responsiveness are maintained as even more stations are added to the cluster. A typical four-station cluster costs $39,800.

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- Agreements have been signed with both NCR and Burroughs to market these low-end machines.

- NEC Information Systems joined the ranks of vendors in the professional workstation market. The PC-8000 System houses a Z80 compatible CPU, 64K RAM, optional 32K ROM, and a floppy disk subsystem in a keyboard/display unit. Prices range from $1,600 to $3,700. NEC designed the system to be used for both data and word processing in small businesses, and as both a remote terminal and a standalone desktop decision support system in large corporations.

- Cado Systems announced a word processing system which also handles bookkeeping, electronic filing, name and address filing, a daily planner, a list management system, and an arithmetic calculator. The Cado Computer-Aided Tutor leads a user step-by-step through each function. A bundled system is $15,990.

- Digital Equipment has designed a standalone word processor/desk-top computer starting at $6,795 with dual floppy disks and an LA 34 Matrix printer. DECmate, as the product is being designated, is being billed by DEC as a "work processor" to connote its multifunction capabilities.

E. COMMUNICATIONS

1. OVERVIEW

- Communications promises to be an increasingly important area for most large information systems departments. The complexities of communications issues will, for better or worse, grow at least as fast as their importance.

  - The technological "answers" multiply like rabbits.

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- Externally, the imposed order that AT&T has exerted for so long is fragmenting.

- Internally, organizations are going to have to face up to the implications of the growing functional interdependence of data processing, office systems, and communications.

2. TECHNOLOGY

- Until very recently, some highly intelligent people and important vendors had placed great emphasis on a few "galactic" solutions that would solve the pressing problems in communications. Examples:

  - ACS (from AT&T) would act as the "universal switch" between different protocols.

  - XTEN (from Xerox) was a satellite-based transmission service using local microwave between customer premises and XTEN nodes.

- ACS is far behind schedule. Whatever finally emerges will be a shadow of what was originally promised.

  - AT&T recently announced that ACS will also support X.25.

- XTEN, after a $30 million investment, was finally cancelled after technical doubts, repeated management shakeups, and required future investments of up to another quarter of a billion dollars.

- Galactic solutions have a great intellectual attraction and an equal pragmatic attractiveness: there are fewer choices to be made with galactic solutions.

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- In communications, a great many choices have to be made. The choices are probably more difficult than in data processing since the categorization is less precise (e.g., the distinctions between mainframes and minicomputers, while blurring, are still useful intellectual categories).

- Take, for example, the definitely subgalactic issue of local networks.

  - Xerox has banged the drum very loudly in favor of Ethernet (much of the volume was probably related to the demise of XTEN).

  - However, Wang has released a competing strategy, Wangnet. The Wang network will allow for the simultaneous transmission of data, word, facsimile, audio and image signals instead of being limited to one of these at a time as in the Ethernet single-channel encoding approach.

  - A Sytek subsidiary, Network Resources, announced the System 40 local network which off-loads networking functions to the network itself. The system uses broadband coaxial cable with throughput greater than one megabit per second using some of the same techniques employed under the Ethernet. The system breaks messages into packets, uses encryption, provides error detection, and coordinates traffic flow at different speeds.

  - Datapoint has had its own local networking alternative in place for several years.

- Decisions will not be easy in this area. See INPUT's report, New Directions in Local Networking, for a full discussion of these issues.

- Despite, or perhaps related to, the demise of XTEN there have been a number of other communication system announcements.

  - Datapoint's long-awaited "Evergreen" voice/data communications system, the Information Switching Exchange (ISX), is designed to handle

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anywhere from 100 to 20,000 voice, data, and text devices, and can switch information generated by these units over a wide variety of facilities including Datapoint's ARC network.

. Data input devices can be either synchronous or asynchronous and can have speeds up to 56K-bits per second.

. As a telephone switching system, the ISX can accommodate most standard Bell-compatible phone instruments as well as two new electronic telephones introduced by Datapoint, the Infoset I and II.

. The ISX is expected to cost approximately $1,000 per line, not including terminal devices. The price puts it squarely in competition with the Rolm CBX and Northern Telecom SL-1.

- Codex Corporation, a manufacturer of various types of data communications products, has announced its data communications network strategy, "Integrated Communications." The intent of the new network design is to provide a data transport capability for users that is essentially transparent and "friendly" to them. In support of the Integrated Communications Network, Codex also introduced several other communications products including a new communications processor, four high-speed network-control modems, a network adapter, and three intelligent terminals.

- As part of a joint venture with Network Systems Corporation, Satellite Business Systems (SBS) announced plans to offer satellite interconnections between local and area networks. Network Systems markets HYPERCHANNEL and will deliver prototypes of its "satellite link adapter" and "maintenance" adapter to SBS. According to Network Resources, dispersed HYPERCHANNEL installations will employ the satellite link adapter in bouncing traffic off the SBS satellite. The

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maintenance adapter is supposed to aid detection of malfunctions along the links.

- Other interesting announcements included:

  - In late 1980, Tandem released a series of new hardware/software data communications connections.

    . Tandem to IBM Link (TIL) establishes a high-speed data link between a Tandem NonStop system or network of systems and an IBM 3803 Mod I or 2 Tape Drive Controller.

    . Tandem HYPER Link allows the interconnection of Tandem NonStop systems with systems connected to a HYPERCHANNEL network.

  - Rolm Corporation bolstered its CBX digital switching system with a new feature said to allow users to integrate the switching of voice and data communications simultaneously. The new feature permits off-site data communications to be handled by pooled modems that are shared among users and automatically allocated by the CBX as needed. For on-site communications, the feature eliminates the need for modems at each terminal and CPU.

    . Rolm has said that any new or installed CBX can be equipped with the data communications feature with the addition of a new software package dubbed Release 7, and three hardware elements, including a desk-top terminal interface, a data line interface mounted in the CBX cabinet, and a time division multiplexer card.

    . Pricing for the systems with the data communications feature was scheduled to range from approximately $600 to $800 per termination point.

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- Systar Corporation has offered users a communications front-end system that brings the X.25 protocol to IBM's System/34 and System/38. The Systar Gateway/34 can connect dispersed users to the System/34 or 38 via any combination of local terminals, dial-up lines, leased lines, and public data networks.

  . By supporting dial-in facilities of public packet networks, Gateway/34 reduces costs: Tymnet or Telenet can provide access at about $5/hr as opposed to $15/hr charged for long-distance telephone use. Terminal costs can also be reduced by using IBM 3101 VDTs which cost less than half of IBM's 5251-2 communicating workstations.

  . Prices for the Gateway/34 range from $16,000 to $28,000. Software carries a one-time fee of $15,000.

- BBN Information Management has designed an electronic mail software package designed to run on multiple hardware/operating system configurations. The Infomail package offers intercomputer communications via existing terminals and networks and is available initially on DEC VAX systems at a $30,000 one-time license fee.

- DEC has entered the X.25 public packet switching network market with the first of its Packet net offerings. The Packnet Program is a collection of DEC's software products, protocols, interfaces, and support services which will link DEC computers into X.25 packet switched networks.

3. NONTECHNOLOGY ISSUES

- As important as technology is in communications, the nontechnology issues will probably have greater overall impact with user corporations.

- The great range of technology now available is in part due to the loosening grip of AT&T on the marketplace. For some years, AT&T has felt very

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frustrated: from its point of view, the pygmies have been dancing around a tethered Bell System tearing off (tiny) bits of flesh.

- The proposed "Baby Bell" would allow AT&T to stamp out a few communications pygmies, while being able to freely enter the previously forbidden data processing market. As the FCC's historic Computer Inquiry II concluded, it is no longer feasible to draw a line between communications and data processing.

- It would appear that AT&T will receive most of what it wants. The Senate has pssed a bill broadly favoring Baby Bell; the House will act in 1982.

- The biggest problem for AT&T is delay. For example, store and forward message service languishes in regulatory and political arenas, while AT&T's other potential suppliers of similar new systems, including IBM, are reportedly positioning themselves for entry into this embryonic market.

  . IBM is rumored to have developed a voice message system which runs on the Series I computer and interfaces with PBXs.

  . With backing from Plantronics, ECS Telecommunications has already installed its first message systems at the sites of a number of large corporate customers.

- INPUT believes that there may be fewer short- and medium-term effects on the marketplace than its competitors fear.

  . The genie is hard to put back into the bottle; i.e., many competitors now have established niches in the market. Even an acquisition spree by Baby Bell (if allowed and if deemed wise) probably would not have much effect since it is unlikely that many entrepreneurs would remain in even a mini-AT&T.

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- Equally important, the failure of galactic solutions lessens the edge of galactic vendors.

- There are many parallels to the AT&T breakup and similar issues now being faced by many IS departments and their parent organizations: How long can data processing and communications remain separate?

  - In a great many organizations, the communications and data processing functions are entirely separate.

  - In others, there is titular unity, but little functional integration.

  - In only a few are the two sides actually meshed.

- The vendors have been convinced for years that the separation is artificial and illusory.

  - First, the FCC was convinced, much to the surprise of many observers.

  - Now, Congress seems well on the way toward being convinced.

- Most vice presidents of information systems (not to speak of those responsible for communications) may frankly be unprepared when AT&T starts to talk to them about data processing solutions (or when IBM begins to discuss communications solutions?).

  - Corporations should begin immediately, if they have not already started, to address the organizational communications-data processing issue. In many instances, the resolution will not be easy. Internal political issues are often as difficult to settle as the external ones that the FCC and Congress have been struggling with.

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- However, it would be embarrassing, to say the least, for large corporations to lag behind the FCC and Congress in identifying and solving these issues.

F. COMPUTER SERVICES

1. OVERVIEW

- Despite the wide variety of purchase options available to users from hardware vendors the computer services industry has flourished. The software segment of this industry will be covered separately; this section of the vendor analysis will focus on processing services offerings. INPUT has estimated that the processing segment of the industry reached $8.3 billion in 1980 and will hit $18.4 billion by 1985.

- The gulf between IS management and processing services vendors remains as great as ever. Both sides regard the other, with much justification, as "the enemy."

  - Most processing services are sold directly to end users without IS budget control or, often, knowledge.

    . While $8 billion in processing services were sold in 1980, reported IS department expenditures in this area were less than one-quarter of this figure.

2. INDUSTRY-SPECIALIZED APPLICATIONS

- Moving commercial timesharing in-house usually focuses on general-purpose timesharing.

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- Specialized commercial timesharing services in such areas as banking and manufacturing appear far more immune to transfer.

  - The specialized knowledge and/or the small size of the job make in-house transfer often more a question of policy than of service or economics.

  - Personal computers may make inroads even here.

- But it is in the area of proprietary data bases that the most interesting developments are occurring.

  - The market for such data bases was $12 billion in 1980. INPUT expects it to increase to $22 billion by 1985.

- ADP and Townsend-Greenspan have added two European data bases to Econanalyst, their joint economic computing service.

  - EUROSPECTUS consists of 400 time series on various economic indicators from six European countries.

  - BANK provides monthly quarterly figures on all significant U.K. financial series.

- CompuServe has expanded the information sources available through its timesharing network. It has added commodity market information and stock prices from the New York and American Exchanges to its data base services. In the area of demographic research, CompuServe introduced SITE II, a program that allows managers to determine the best location for a new business.

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- Comshare has added a product evaluation tool to its timesharing network. The New Product Introduction System is a cluster of computerized information analysis aids that support the financial marketing management decision of clients in the consumer goods and industrial manufacturing business.

- Dow Jones & Co. established Dow Jones Cable Information Services to supply the Dow Jones data base to cable television systems. Dow Jones had previously made its News Retrieval Service available to users of Atari 800 and 400 personal computers.

- National CSS announced that the demographic data from the 1980 census data are available on the company's remote computer services network.

- Rapidata has expanded its data base services.

  - The Citibase-Weekly data base of money supply statistics from Citibank has been made available to users of Rapidata's nationwide computer system. The data base includes current exchange rates, spot market indices, and key production data for several industries.

  - A new data base, which provides both current and historic trading data and both financial and descriptive information on over 32,000 securities, has also been released by Rapidata.

- Source Telecomputing and Tymshare have entered into a development and pilot operation agreement under which Tymshare will provide services to increase the user capacity and technology of The Source's consumer information network.

  - Tymshare will use its experience in developing distributed multiple access data bases and operating more than 50 mainframes as a computer services company in order to help The Source increase the benefits to its present users.

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- Tymshare's Tymnet public packet network will also be involved in The Source's expansion program.

- The impact of these and similar developments on corporations and IS departments will be significant.

  - User departments will have much more data available for operations (e.g., physical property data bases), financial control (e.g., economic and financial time series), and business planning (e.g., consumer preferences).

  - They will need assistance in matching their needs to the correct data base as well as technical assistance to mesh the externally supplied data with other corporate data.

  - The existence of sudden new pools of data will make the internal data base administration function more important.

G. SOFTWARE

1. OVERVIEW

- Software companies constitute one of the fastest growth industries in the United States. INPUT has estimated that revenues of software companies will grow from $3.6 billion generated in 1980 to $15 billion in 1986.

- This is because software packages are increasingly acceptable.

  - Systems and computer operations support software has such obvious advantages over self-written software that the question is rarely debated any longer.

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- Cross-industry financial software is rapidly attaining the same status.

  - It would take a brave person and require much justification to propose writing an in-house payroll system from scratch, for example.

  - Similarly, most companies have abandoned in-house financial modeling systems in favor of outside packages.

- In a few areas, software is pushing into areas that have never really been computerized effectively before; e.g., capacity planning software.

  - The Questor capacity planning package marketed by Boole & Babbage has joined the successful BEST/I product from BGS Systems.

    . BGS has in turn introduced CRYSTAL for further automating the feeding of performance data and assumptions into BEST/I.

- However, the real frontier that is being constantly expanded is in applications software.

  - Software products from firms like PMS (insurance) and SEI (banking) have become widely accepted in industries where only a few years ago do-it-yourself applications were the almost invariable rule.

  - The main challenge in applications software, for customer and vendor alike, is to find the right balance between flexibility and ease of use; there are usually trade-offs between the two. The best packages make happy and intelligent compromises.

- The two areas of most promise as well as much recent activity are data base manipulation and personal/small computer software.

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2. DATA BASE MANIPULATION

- Many software vendors (e.g., PMS and SEI referred to earlier) offer software specifically tailored to a particular industry's unique functions and needs; others, like MSA or McCormack and Dodge, offer software aimed at a particular function and usable by almost any firm with that function.

- Another approach is to offer a very general set of software tools that customers (not always trained data processors) can use as systems building blocks.

- The classic data base management systems packages are central to this category. However, in the last year, an interesting trend has been taking place: the DBMS is no longer just a standalone package, but will be embedded in a "constellation" of products (all linked to and drawing upon the central DBMS).

  - Cullinane has linked together its own system products, under the name IDMS-1982, and has recently added under license the McCormack and Dodge financial software package and a banking package. Other industry oriented packages may be announced.

  - ADR has an integrated set of system packages, recently adding the Foundation package, usable by EDP neophytes, to retrieve and manipulate data interactively.

  - Cincom, which has offered a TOTAL-based manufacturing package for some time, has recently announced a series of system building modules as part of Series 80 Data Control System.

- Other, standalone data manipulation products recently announced include:

  - Mark V from Informatics which is an interactive, enhanced version of the long-established Mark IV batch data retrieval package.

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- Planning Research's (PRC) Program Products Group introduced its Central Software development tool that runs on DEC PDP 11/34 and 11/70 systems. Central Software includes up to eight levels of security controls, screen formatting, automatic edits, a data base manager, and programmer and user aids such as on-line applications programming, debugging, diagnostic aids, and message switching. According to PRC sources, Central Software can reduce development time and costs for interactive systems by up to 90%.

- There have also been a series of announcements on new types of data base software. Many of these are labeled "relational" and, in essence, are supposed to offer users much more flexibility in being able to easily access data in ways not thought of when the data base was originally set up. Announcements include:

  - Two firms, Relational Technology (RTI) and Relational Software (RSI), that have both provided DEC VAX users with new DBMS packages. RTI's INGRES and RSI's ORACLE are quite similar.

    . Both are written in "C" language and both are true to the relational DBMS model.

    . The RTI system is the offspring of the PDP-11-based INGRES developed at the University of California, Berkeley. RTI has also announced that the VAX version of INGRES will eventually be enhanced with a report writer, forms processing interface, a natural language facility, and a graphics package.

  - IBM has finally released one version of its long awaited relational data base, the Structured Query Language (SQL) for DOS users. The software permits data to be defined in tabular form and accessed through operations on the tables. Some industry observers have indicated that SQL might become the de facto relational language standard for the 1980s.

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- Another and altogether new type of DBMS has been offered by Comshare. In cooperation with Set Theoretic Information Systems, Comshare is marketing COMMANDER 4. The new DBMS is based on the "set theoretic" approach which reportedly synthesizes filed data into filed information. That is, information is essentially queried data that gains meaning at the requestor interface, and the implication is that the file is a collection of results, instead of schematized data or independent relations.

  . The important feature of the set theoretic approach is that it is strictly an organizational technique and does not require any special hardware.

  . According to Comshare, it can outperform relational bases by a factor of four.

- A division of GTE released Relate 80 for users of HP 3000, DEC 11/70, and DEC VAX 11/780 machines. Relate 80 contains the "unanticipated query function" which appears to be a content addressability feature that builds correlations among accessed data and then develops counterqueries for the user based on the implications of the correlations and on logically missing information.

- The impact and usefulness of these products are difficult to assess at this time. Industry gurus differ in their analyses and cannot, for example, agree on whether self-described relational data bases are really relational or, even, what "relational" means.

  . A true relational data base would, for example, be most useful in very large data bases where the penalty for reorganization would be very high.

- However, no "relational" products have been announced except for use on small systems.

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- When dealing with relatively small file subsets, several existing DBMS and query languages can be used at least semi-"relationally," at the cost only of some inefficiency.

3. PERSONAL/SMALL COMPUTER SOFTWARE

a. Overview

- There is little question that, "pound for pound," the best software (and most of the new software) being produced now is for personal/small computers.

  - By this time everyone is aware of the VISICALC Horatio Alger story. Even more impressive than its sales records, is the reason for its sales: it fills an important need, is cheap (in quantities of one) and easy to use.

    . INPUT has spoken to vendors of mainframe-based modeling packages costing many times more than VISICALC who view it as very serious competition.

  - VISICALC is just the tip of the iceberg. To use an analogy: software for small computers as recently as four years ago was like Japanese products of 1950; this software is now at least up to the late 1960s, using this comparison.

  - It is important to understand why there has been so quick an improvement. INPUT sees several factors.

    . The explosion of good, cheap hardware. Every system developer can now have a personal machine.

    . The bringing together of the problem, problem solver, and machine into a focused point in time and space. Many large-scale systems go awry because there are too many people

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working over too long a period: communications break down on the fine points that are critical to system success.

. Pride of authorship.

. Personal economic incentives.

b. Hardware Vendor Effects

- Hardware vendors in general are increasingly recognizing the advantages of marketing approaches developed by independent software vendors.

  - Many hardware firms acquire outside software and market it as their own.

  - Most of the minicomputer/small system firms have catalogs of independently produced applications for their machines (e.g., Wang, DEC, HP, Perkin-Elmer).

  - Burroughs has recently gone further in announcing that it would jointly market Burroughs hardware and independent software, including commission sharing with the software vendor.

  - These actions recognize two things:

    . Software resources are limited.

    . "Software factories" may not be conducive to turning out good software, especially applications software. (This last point is not subscribed to by all vendors.)

- IBM in introducing its Personal Computer has taken a bold step that may well turn a liability into an asset.

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- IBM's problem is that having entered the market so long after Apple and Tandy, it does not have a library of proven, proprietary software to help sell its machines; many Apples were sold just so VISICALC could be used, for example.

- IBM has taken immediate steps by selling under license proven products such as those from Peachtree Software (which in turn was recently acquired by MSA).

- IBM has also announced that it will distribute user-written software on a royalty basis. To get the ball rolling, IBM has offered Personal Computers to its employees on concessionary terms and is encouraging them to write software (for which they will obtain royalties). A large proportion of early Personal Computer production will go to IBM employees, with the hope that much usable software will be produced.

- IBM's innovative approach should succeed admirably, combining IBM's position and marketing power with the advantages of small-scale software. This approach should soon become widely imitated and an industry "standard." This will have major impacts on large organizations in two ways:

  - Changing the process of system design.

  - Offering IS organizations an opportunity to become commercial software producers.

c. Impact On Information System Departments

- The relative importance and advantages of small-scale systems over large-scale systems should increase. This will make basic system positioning decisions much more difficult in the future as nonmainframe options become more widespread and attractive.

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- Very large and very small computers may squeeze out the middle-sized machines. This will be a primarily software-driven phenomenon.

- Large companies expecting to be ordering many personal/small computers should be alert to the opportunities - and problems - in their own staff preparing software for outside distribution and sale.

  - Companies can take one of three postures.

    . Ignore the issue, and allow employees to sell what is arguably company property. Employees who wished to avoid legal and ethical problems would probably develop an improved version on their own time, thus not giving their employer even a temporary edge over the competition.

    . Seek to control such development, either by denying resale or keeping all revenues. This would tend to drive development underground and could discourage development of the best version for company use.

    . Share rewards with employees, through economic incentives and, perhaps, internal royalties for proprietary products. This option might involve more management time than the "control" option.

  - The advantages for the companies that get involved are improving their own software and the potential for a new revenue stream and, possibly, developing a new business.

    . Exhibit II-3 shows the pros and cons of the different approaches.

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EXHIBIT II-3

COMPANY INVOLVEMENT IN PERSONAL COMPUTER
SOFTWARE DEVELOPMENT FOR OUTSIDE SALE

	COMPANY POSTURE VIS-A-VIS EMPLOYEES' DEVELOPING PERSONAL COMPUTER SOFTWARE FOR RESALE		
	IGNORE	SHARE	CONTROL
Advantages	• No management time involvement (in what may be a peripheral matter) • No company liability for faulty product	• Company receives part of revenue • Company probably receives use of best form of software • May develop a new business	• Company keeps all revenue • May develop a new business • Can deny a proprietary product to the competition
Disadvantages	• No chance of taking part in a (probably small) revenue stream • On-job private development likely • Best form of software may be denied to company	• Management time involvement • Potential company liability for faulty product • Company receives part of revenues	• Management time involvement • Employees will often hide development • Employees may not take part • Potential company liability for faulty product • Best form of software often denied to company

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H. IBM SYSTEMS EVOLUTION IN THE 1980s

1. OVERVIEW

- INPUT believes that IBM is moving in very specific ways to broaden and intensify the level of support that corporate information systems departments can provide to information handling end users.

- Over the past few years, IBM management has been articulating its concerns over office workers' productivity.

  - During a presentation to security analysts at Burlington, Vermont, in May 1979, B.O. Evans, IBM vice president for engineering, programming, and technology, pointed out that office costs had more than doubled in the preceding ten years to the point where they represented roughly half of corporate expenses, while office workers' productivity showed little, if any, improvement over the same period.

- IBM competitors such as Xerox, Datapoint, Wang, and others are focusing their strategic efforts on capturing a significant proportion of the potential market for office automation products and services.

  - Unlike IBM, however, IBM's most aggressive competitors in the arena of office automation do not have a sizable base of central computing equipment that figures significantly in their strategic plans.

  - Rather, their efforts rely to a large extent on coexisting with IBM central systems.

- Meanwhile, IBM has had to cope with a variety of problems in recent years that have been adversely impacting its return on revenues.

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- Since 1977, IBM's operating margin has declined almost four percentage points due to a combination of factors including a change in the product mix, double-digit inflation, and in INPUT's estimation, a serious erosion of both competitiveness and profitability of office products in the domestic marketplace.

- On the competitive front, plug-compatible manufacturers (PCMs) have been attacking IBM's installed base of processors and peripherals.

- Substantial third-party leasing company activity very likely exerted a disruptive influence on IBM's financial and manufacturing planning in recent years.

• Through its recent series of product announcements in large, medium, and small-scale computing and office equipment to the announcement of its (interim) internal reorganization on October 1, 1981, IBM has indicated its intention to automate all the corporate information-handling functions, while concurrently responding to the factors that have been pressuring profit margins.

- INPUT believes that central nodes of future corporate information systems will evolve from present-day installations to multiple-processor complexes through the addition of CPUs and devices to existing equipment as needed, rather than wholesale displacements of equipment as newer technology models are introduced.

- Besides observing that the evolving architecture of the IBM 3033 and the announced architectural features of the IBM 3081 strongly allude to the modular nature of future central large systems, and that MVS/SP supports multiple-processor architectures, INPUT also believes that the incremental form of system evolution is in both the users' and IBM's best interests, as it tends to be least disruptive of IBM's and users' progress.

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- IBM's new organization appears to work toward easing the users' task of integrating disparate types of IBM products - i.e., computer room, manufacturing floor, and office equipment - as the consolidation of three divisions' marketing and service forces will present the user with a single IBM interface for sales and support.

- With the introduction of the IBM Personal Computer, IBM appears to be encouraging the transfer of some application development responsibility from the EDP department to those who have the most intimate and comprehensive understanding of each application.

  - This would tend to accelerate the automation of office information handling systems, as the program distribution mechanism that IBM has established, together with the inducement of royalties, is likely to encourage the rapid build-up of applications packages.

  - While promising to ease the applications backlog, the proliferation of personal computer installations (IBM or otherwise) will probably transform the nature of the information systems activity into more of a consultative and technical support function to ensure the proper interfacing of user-driven equipment used in operational areas with corporate data bases maintained on central systems.

  - Additionally, it is likely to intensify the requirements for large-scale equipment acquisition planning, as acceptable central system response times must be maintained.

- Since most other vendors of office automation systems now offer some support for IBM protocols and data formats, the problem of interfacing non-IBM equipment with IBM-based systems is likely to be nominal if these standards and some attention to portability of software are adhered to.

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2. IBM'S REORGANIZATION

- Exhibit II-4 shows how IBM has realigned its various operating divisions.

  - Previously, IBM had two major product-oriented marketing groups (the Data Processing Marketing Group and the General Business Group) and a support group for the DP Marketing group, namely, the DP Product Group.

  - While the General Business Group could and did avail itself of the technology developed by the DP Product Group, the latter's development emphasis had been placed on the larger computing systems and related products.

  - Product management and system development responsibility for smaller systems as well as typewriters and copiers had resided in the Information Systems Division (ISD) of the General Business Group.

- In the organizational realignment that became effective October 1, 1981, all domestic IBM marketing and service forces have been consolidated into a single group, the Information Systems Group (ISG).

  - Although Exhibit II-4 shows several divisions reporting into ISG, by the first quarter of 1982 they will have been restructured into two new divisions responsible for marketing and servicing the full range of office product, general systems, and data processing product lines to a specific set of customers.

- The Information Systems and Technology Group (IS&TG) has responsiblity for larger information processing systems (i.e., the IBM 4341 and up) and related storage devices, non-impact system printers, and related software, as well as responsibility for development, manufacturing, and packaging of semiconductor components and devices.

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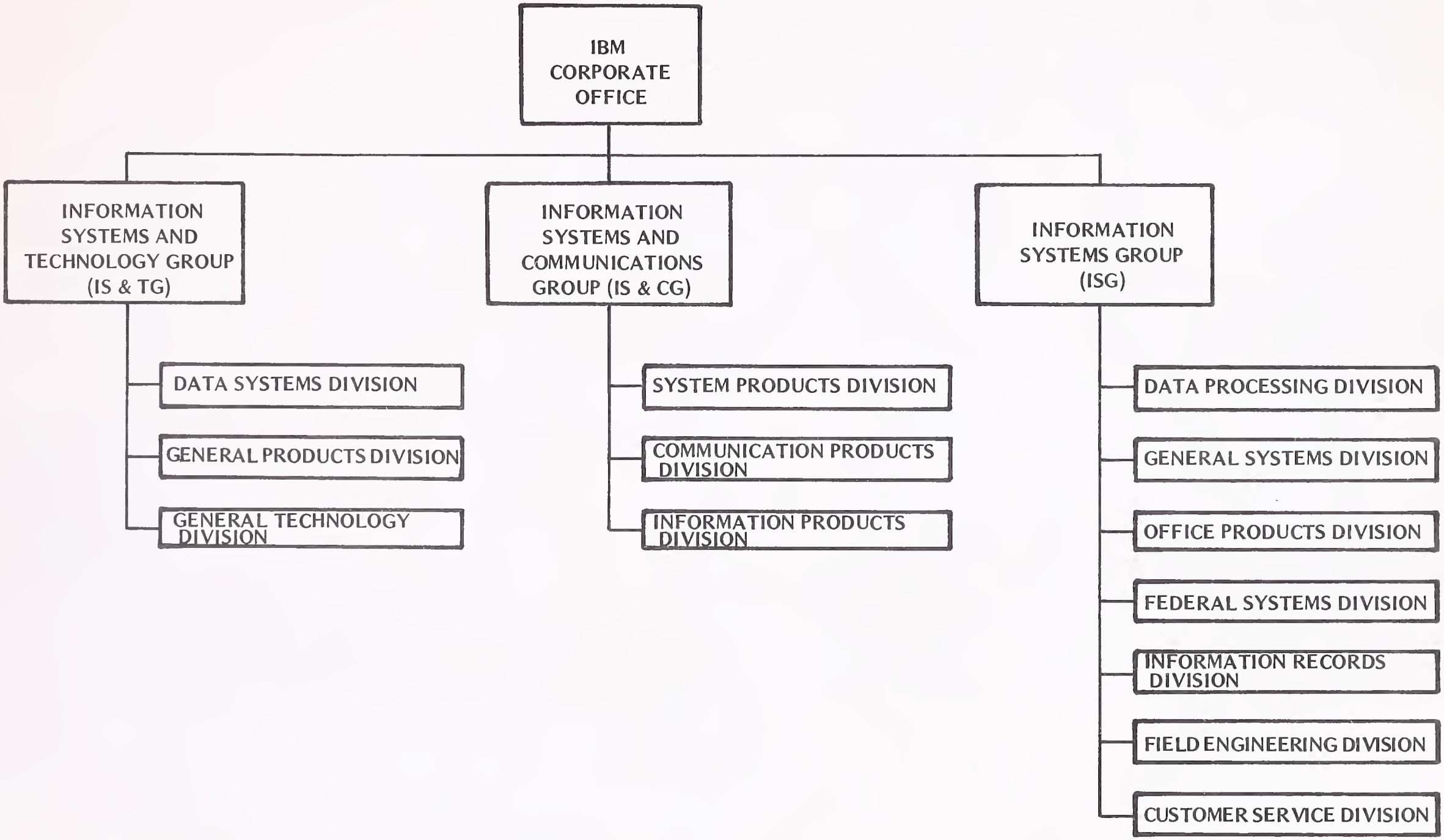
EXHIBIT II-4

IBM ORGANIZATION EFFECTIVE OCTOBER 1, 1981



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- The Information Systems and Communications Group (IS&CG) has responsibility for smaller information processing systems, related peripherals, office products and systems, communications products, and related products.

  - In INPUT's opinion, the realignment of communications products responsibility with smaller systems reflects a shift of development emphasis toward telecommunications support of smaller systems, probably to accelerate the potential for integrating smaller systems into SNA complexes.

- From the user's standpoint, the consolidation of marketing and service organizations appears highly likely to ease the problems formerly associated with having to deal with up to six different organizations, while from IBM's perspective a much more streamlined and cost-effective field organization is likely to ensue.

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III INFORMATION SYSTEMS CROSS-INDUSTRY ANALYSIS

III INFORMATION SYSTEMS CROSS-INDUSTRY ANALYSIS

A. EDP/COMMUNICATIONS SPENDING IN 1981/1982

1. OVERALL

- INPUT estimates that cumulative expenditures by EDP departments for EDP and communications in the United States by year end of 1981 will reach a total of $50.4 billion, as shown in Exhibit III-1. (Overall spending for EDP and communications, by both EDP departments and non-EDP customers, is likely to rise approximately 17% to around $65 billion. IS management in this sample is also reporting an increase of the same magnitude; but a lower rate of 12.5%, explained in Appendix A, holds true when the thousands of small organizations not included in this sample are counted in.)

- In 1982, the corresponding total EDP expenditures from EDP budgets will reach $56.9 billion, an increase of 12.9%.

- Analysis of the responses supplied by this year's panelists indicates that aggregate spending for the following items, shown in Exhibit III-2, will increase by a greater amount than the increase in the total budget:

  - Salaries (some sectors only).

  - Central site and remote site processors.

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EXHIBIT III-1

EDP SPENDING BY
INDUSTRY SECTOR*
($ billions)

INDUSTRY SECTOR	1981	1982
Discrete Manufacturing	$13.1	$15.2
Process Manufacturing	6.8	7.7
Transportation	1.3	1.4
Utilities	2.6	3.0
Banking/Finance	5.3	6.2
Insurance	6.1	6.7
Education	2.1	2.2
Distribution	5.0	5.5
Government	3.6	4.0
Service and Other	4.5	5.0
Total*	$50.4	$56.9

*BUDGETED AND SPENT BY EDP ORGANIZATIONS ONLY

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EXHIBIT III-2

RAW CHANGES IN EDP BUDGETS FOR RESPONDENTS
IN ALL INDUSTRY SECTORS

BUDGET CATEGORY	PERCENT REPORTING*	BUDGET CATEGORY RAW AVERAGES ($ thousands)		RAW PERCENT CHANGE 1981-1982
		1981	1982	
Salaries	87.1%	$3,457.9	$3,881.7	+12.3%
EDP Training	63.3	35.8	38.7	+ 8.1
Non-EDP Training	12.1	26.7	29.3	+ 9.7
Central Site Mainframes	71.4	973.0	1,108.9	+14.0
Central Site Peripherals	52.2	400.6	426.2	+ 6.4
Remote Site Mainframes	11.6	1,015.2	1,207.1	+18.9
Remote Site Peripherals	15.2	203.8	212.4	+ 4.2
Minicomputers	24.1	687.1	833.4	+21.3
Microcomputers/Personal Computers	6.7	9.8	18.1	+84.7
Terminals	60.3	473.9	521.4	+10.0
Communications Hardware and Software	48.7	263.6	295.6	+12.1
Network Expense	44.2	1,218.2	1,354.1	+11.2
Other Software	55.4	205.0	241.6	+17.9
Vendor Maintenance	62.5	895.6	1,003.7	+12.1
Third-Party Maintenance	16.1	104.6	111.1	+ 6.2
Outside Services	28.6	365.2	398.6	+ 9.1
Data Security	15.6	70.2	70.9	+ 1.0
Disaster Planning	13.4	20.5	20.9	+ 2.0
Supplies and Other	77.7	784.2	867.1	+10.6

*SOME RESPONDENTS DECLINED TO FURNISH DETAILED BUDGET BREAKDOWNS. AVERAGES SHOWN ARE BASED ON THE DATA FURNISHED BY THE INDICATED PERCENTAGE OF THE ENTIRE SAMPLE. CONSEQUENTLY, TOTALS WILL NOT EQUAL 100%.

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- Minicomputers.
- Microcomputers.
- Software.

- However, the aggregate responses are misleading for purposes of the typical EDP planner, since small movements up or down in densely populated industry sectors can swamp the data from smaller sectors.

- Exhibit III-3 is a normalized presentation of the same budget changes shown in the previous exhibit, but with weighting adjustments applied to give a more accurate picture from the individual budget planner's point of view.

- Under these conditions, the budget categories showing the largest percentage increases in almost all industry sectors are:
  - Micro and personal computers (37%).
  - Data security (16%).
  - Purchased software (15%).
  - Terminals and other communications expenses (10-15%).
  - Training for non-EDP personnel (11%).
- Receiving less than the average percentage increase are:
  - Disaster planning (3%).
  - Remote site peripherals (6% - but often not budgeted separately).
  - Supplies (6%).

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EXHIBIT III-3

NORMALIZED CHANGES IN EDP BUDGETS FOR RESPONDENTS
IN ALL INDUSTRY SECTORS

BUDGET CATEGORY	NORM (Percent)*	NORMALIZED BUDGET			PERCENT CHANGE 1981-1982**
		PERCENT OF BUDGET	1981 ($ Thousands)	1982** ($ Thousands)	
Salaries	100.0%	47.2%	$3,457.9	$3,800.2	+9.9%
EDP Training	72.3	0.8	25.9	28.5	+ 9.9
Non-EDP Training	13.8	0.0	3.7	4.1	+10.7
Central Site Mainframes	83.1	11.9	808.6	874.1	+ 8.1
Central Site Peripherals	59.5	6.1	238.4	255.1	+ 7.0
Remote Site Mainframes	13.3	1.1	135.0	146.1	+ 8.2
Remote Site Peripherals	17.4	0.6	35.5	37.6	+ 5.8
Minicomputers	28.2	1.5	193.8	209.5	+ 8.1
Microcomputers/Personal Computers	7.7	0.0	0.8	1.1	+36.7
Terminals	68.7	5.3	325.6	375.4	+15.3
Communications Hardware and Software	55.4	1.7	146.0	162.4	+11.2
Network Expense	50.3	1.3	612.8	674.1	+10.0
Other Software	63.1	2.3	129.4	148.7	+14.9
Vendor Maintenance	71.8	5.0	643.0	687.4	+ 6.9
Third-Party Maintenance	18.5	0.5	19.4	20.7	+ 6.8
Outside Services	32.8	1.4	119.8	128.4	+ 7.2
Data Security	17.9	0.1	14.6	17.0	+16.1
Disaster Planning	15.4	0.1	3.2	3.3	+ 3.3
Supplies and Other	89.2	8.9	699.5	744.3	+ 6.4
Unspecified	100.0	4.2	333.8	364.8	+ 9.3

*RESPONDENTS REPORTING CATEGORY AS A SEPARATE BUDGET ITEM. SALARIES = 100%
**WEIGHTED BY INDUSTRY AVERAGES.

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- Maintenance, outside services, and central site peripherals (each about 7%).

- As indicated in the pertinent industry sector exhibits in Chapter IV, percentages vary considerably from one industry to another, and averages stated here should be considered guidelines only. For example:

  - The projected increase in salaries ranges from a high of 17% in the utilities sector to a low of 3% in education.

  - Discrete and process manufacturing sectors project increases of 8.5% and 6.3%, respectively, for remote site processors, while the distribution sector (wholesale and retail) forecasts the largest gain at 12.1%.

  - Expenditures for data security and disaster planning are negligible percentages of the overall budget, and organizations who reported spending anything for disaster planning were the exception rather than the rule. Of course, some expenditures for these items are no doubt lumped together in the "Supplies and Other" category.

2. PERSONNEL

- For the fourth consecutive year, the largest single budget category, EDP personnel salaries, remains at close to 47% of the total budget.

- The ratio of EDP employees to total company employment is shown in Exhibit III-4.

  - Generally, this ratio tends to be higher among smaller organizations, consistent with the findings of prior years.

- Exhibit III-5 shows the average EDP budget per EDP employee in the two size groups for each industry sector.

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EXHIBIT III-4

NUMBER OF EDP EMPLOYEES
PER 100 COMPANY EMPLOYEES

INDUSTRY SECTOR	COMPANY SIZE CATEGORY (ANNUAL SALES OR ASSETS)	
	UNDER $250 MILLION	OVER $250 MILLION
Discrete Manufacturing	2.0	1.3
Processing Manufacturing	1.5	1.8
Transportation	0.6	2.5
Utilities	5.3	2.7
Banking/Finance	9.6	6.3
Insurance	8.5	8.7
Education	1.5	0.4
Distribution	1.2	0.8
Government	1.9	N/A
Service and Other	5.9	1.6

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EXHIBIT III-5

BUDGET PER EDP
EMPLOYEE
($ Thousands)

INDUSTRY SECTOR	COMPANY SIZE (ANNUAL SALES OR ASSETS)	
	UNDER $250 MILLION	OVER $250 MILLION
Discrete Manufacturing	$50.3	$57.3
Processing Manufacturing	45.6	51.9
Transportation	31.3	59.1
Utilities	35.1	54.3
Banking/Finance	30.9	43.8
Insurance	51.7	34.9
Education	37.5	N/A
Distribution	37.8	50.8
Government	37.6	69.5
Service and Other	48.9	50.4

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- As may be expected, spending per EDP employee tends to rise as the organization gets larger, reflecting the increased investment in equipment, training, more complex systems, and other logistical diseconomies.

- The exception in this year's sample is the insurance sector.

B. EDP PLANS AND PROBLEMS

1. CURRENT DIRECTIONS

- Exhibits III-6 and III-7, respectively, are tabulations of respondents' highest priority plans and problems.

- The improvement of EDP personnel productivity remains the number one or number two priority plan for information systems directors in the 1981-1983 period.

  - Comparison with the problem list, however, reveals that almost half of those ranking personnel productivity among their top five problems in 1981 do not have a plan to address this area of concern.

  - Three of the six most frequently mentioned problems are personnel oriented.

- Demographic trends clearly indicate that staffing problems will persist throughout the 1980s.

  - In a recent edition of the Monthly Labor Review published by the Bureau of Labor Statistics, the BLS made three different economic forecasts, and under each forecast, the list of occupations that are most likely to be in demand did not change significantly.

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EXHIBIT III-6

COMPANY PLANS,
1981-1983

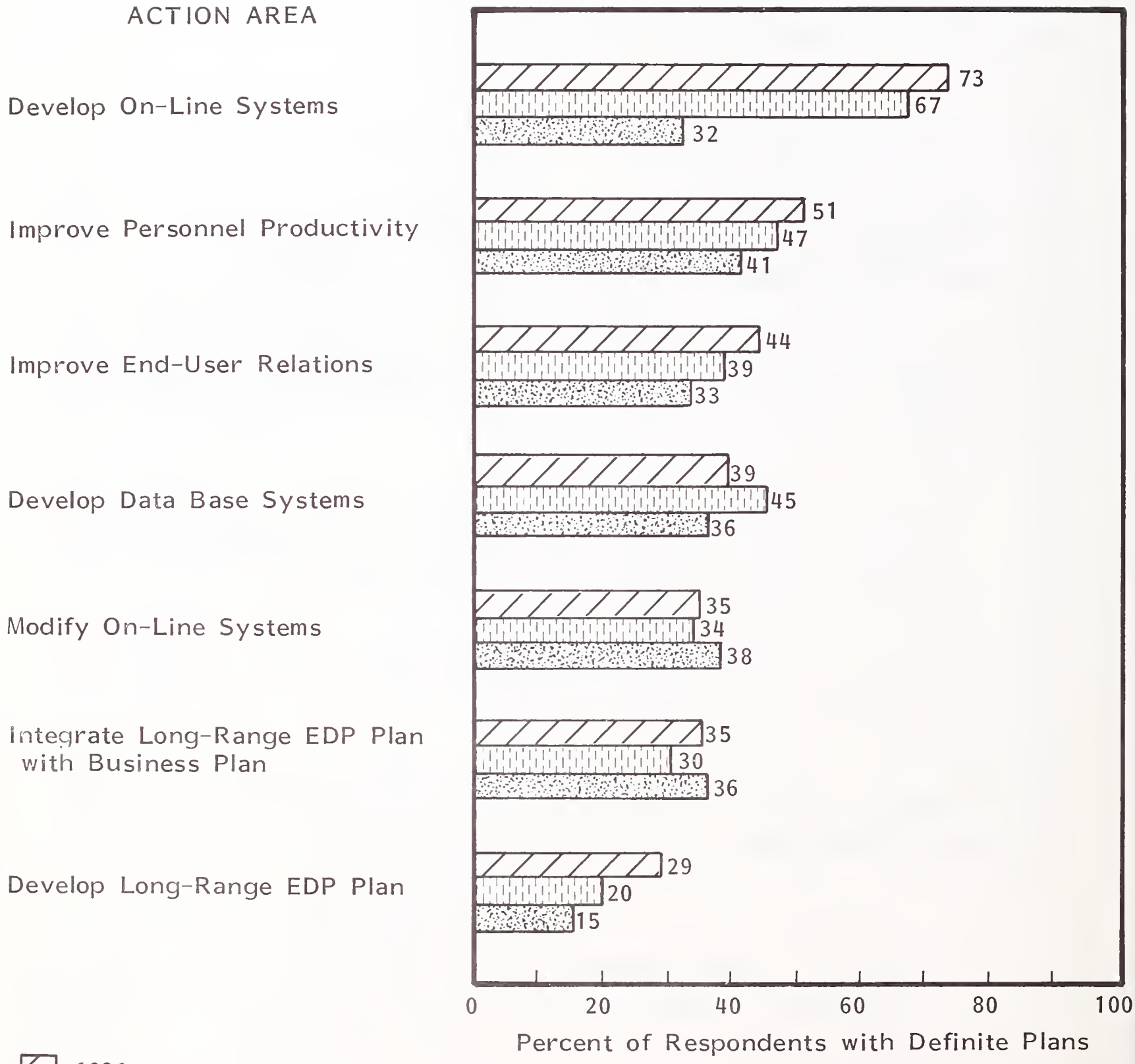

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EXHIBIT III-6 (CONT.)

COMPANY PLANS,
1981-1983

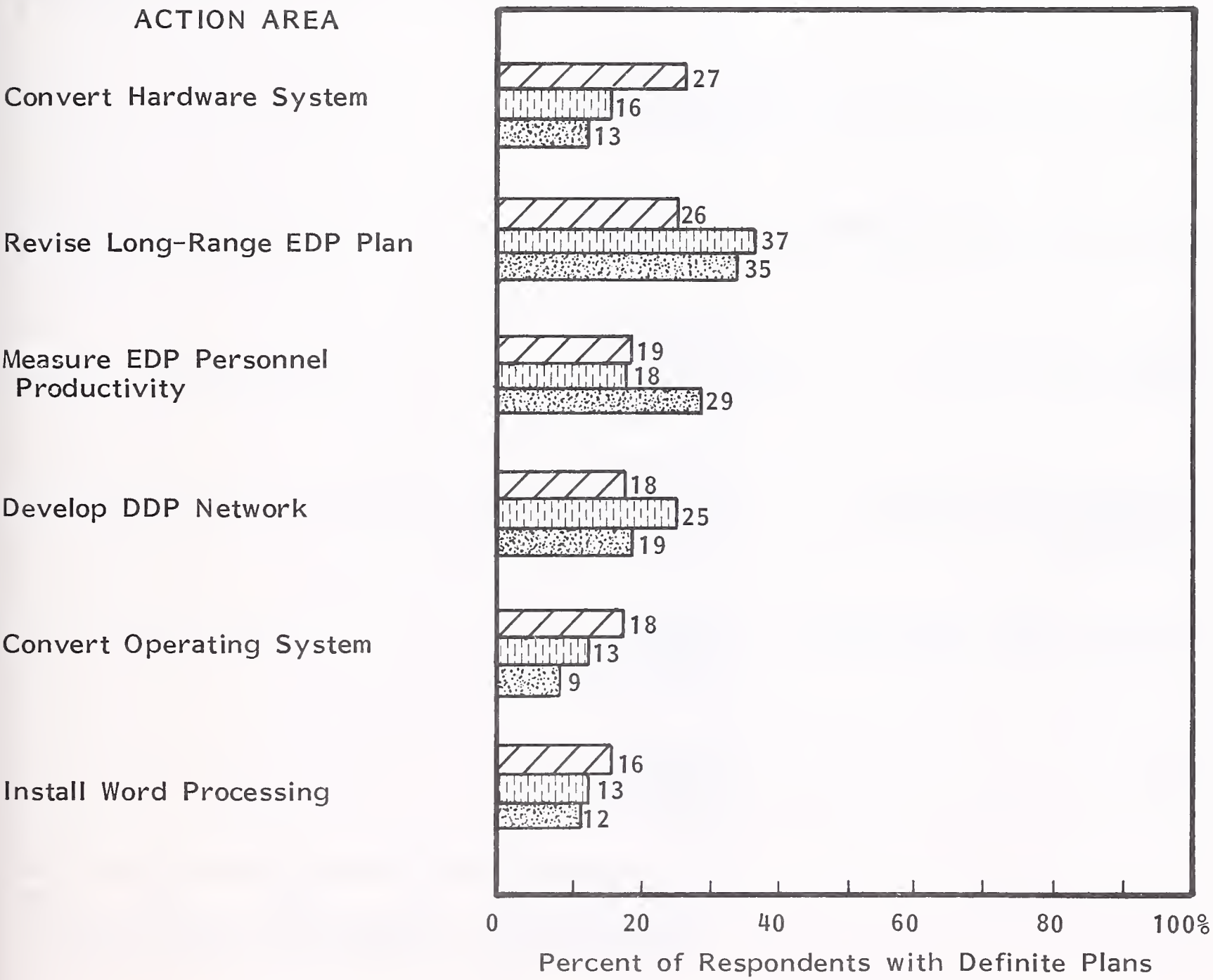

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EXHIBIT III-6 (CONT.)

COMPANY PLANS,
1981-1983

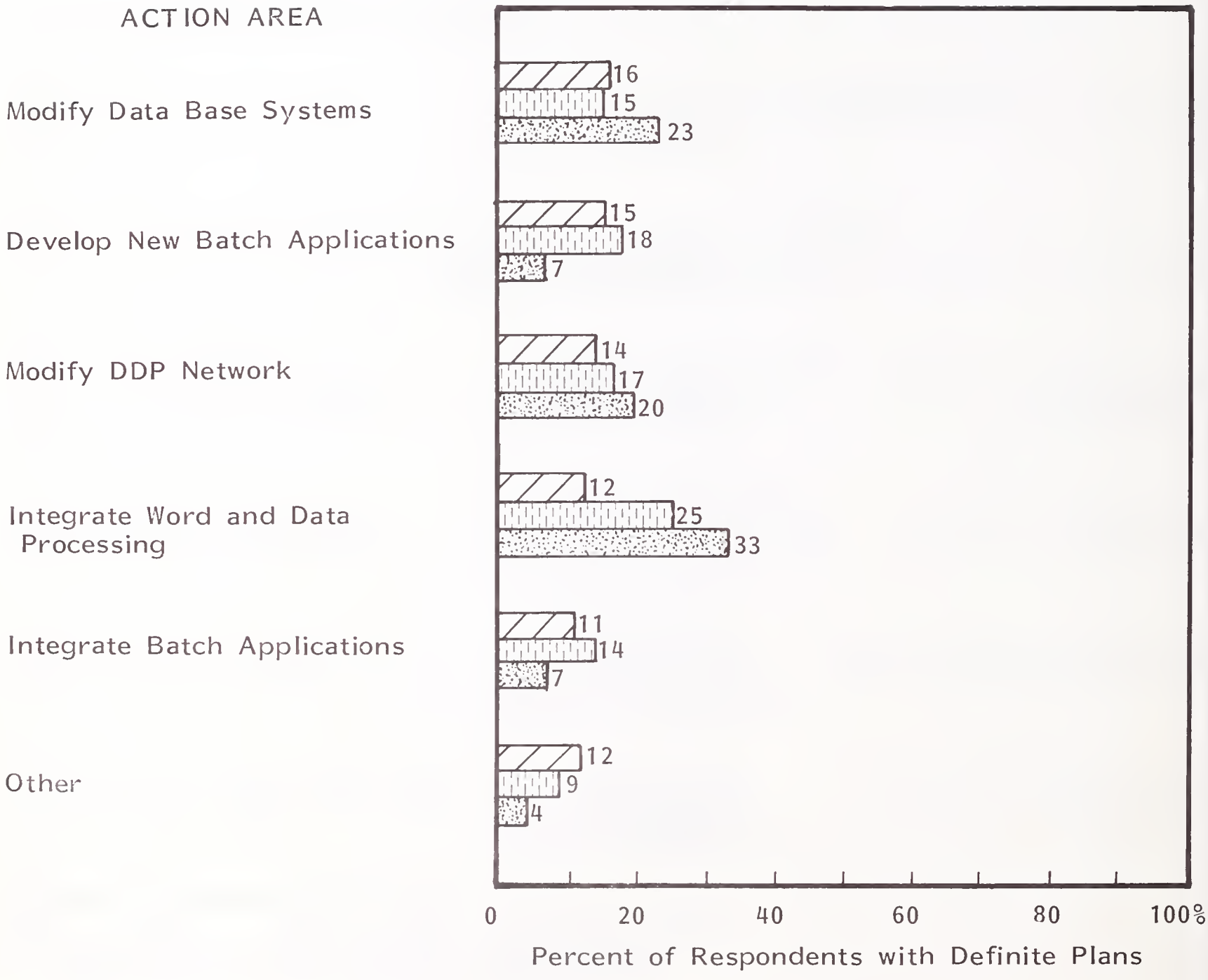

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EXHIBIT III-7

EDP PROBLEMS AND PLANNED CORRECTIVE ACTION (ALL SECTORS)

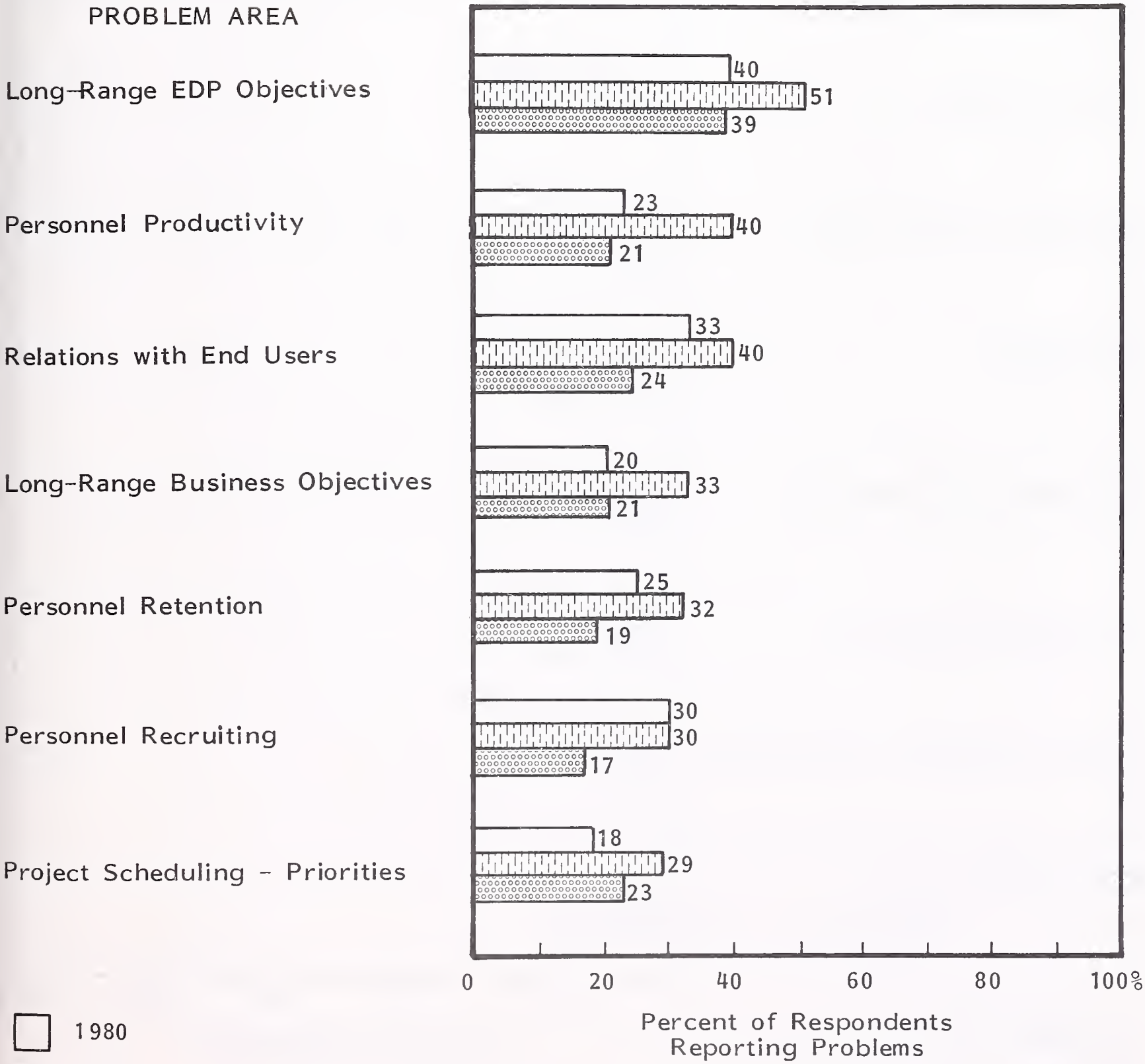

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EXHIBIT III-7 (CONT.)

EDP PROBLEMS AND PLANNED
CORRECTIVE ACTION
(ALL SECTORS)

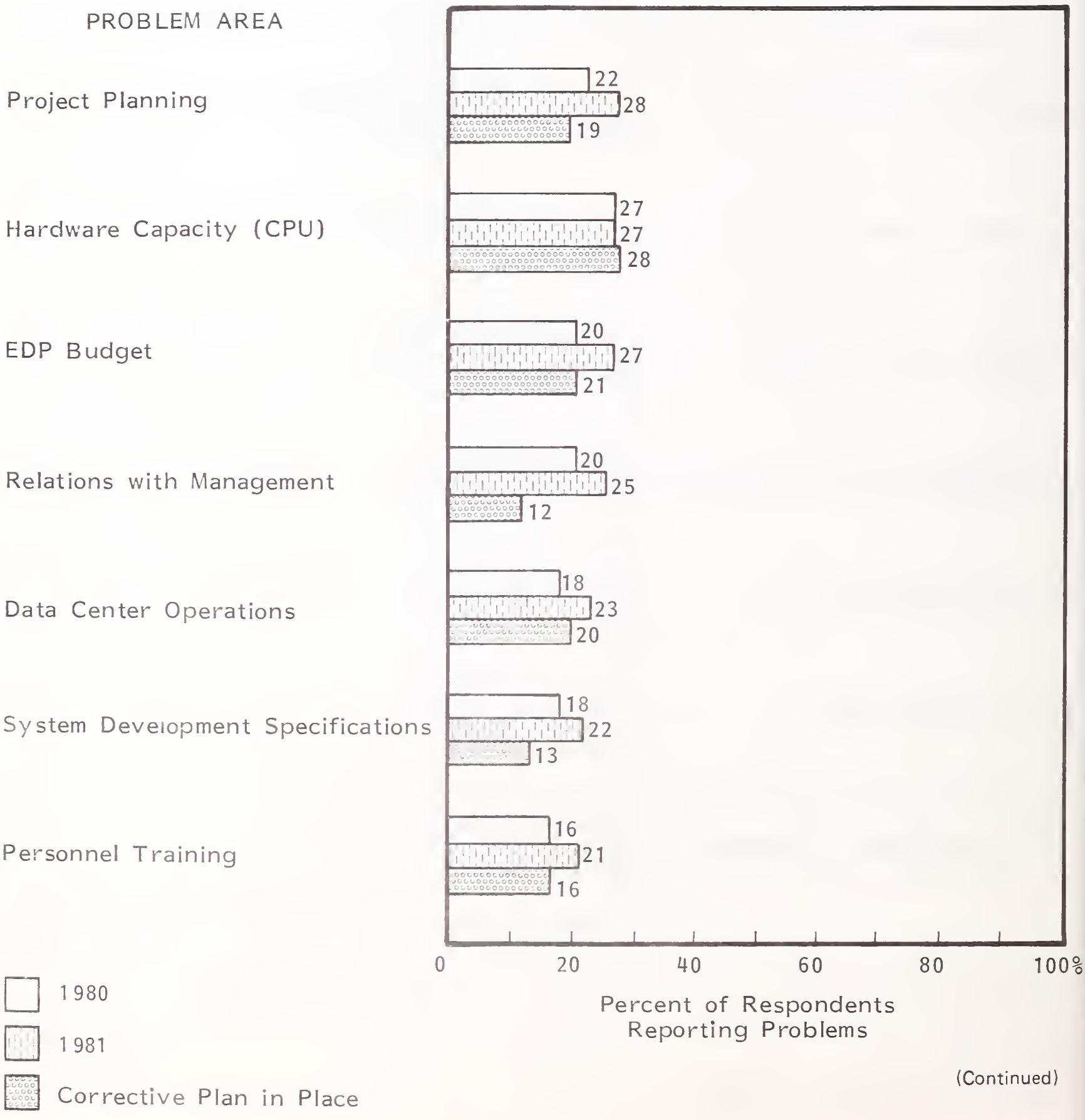

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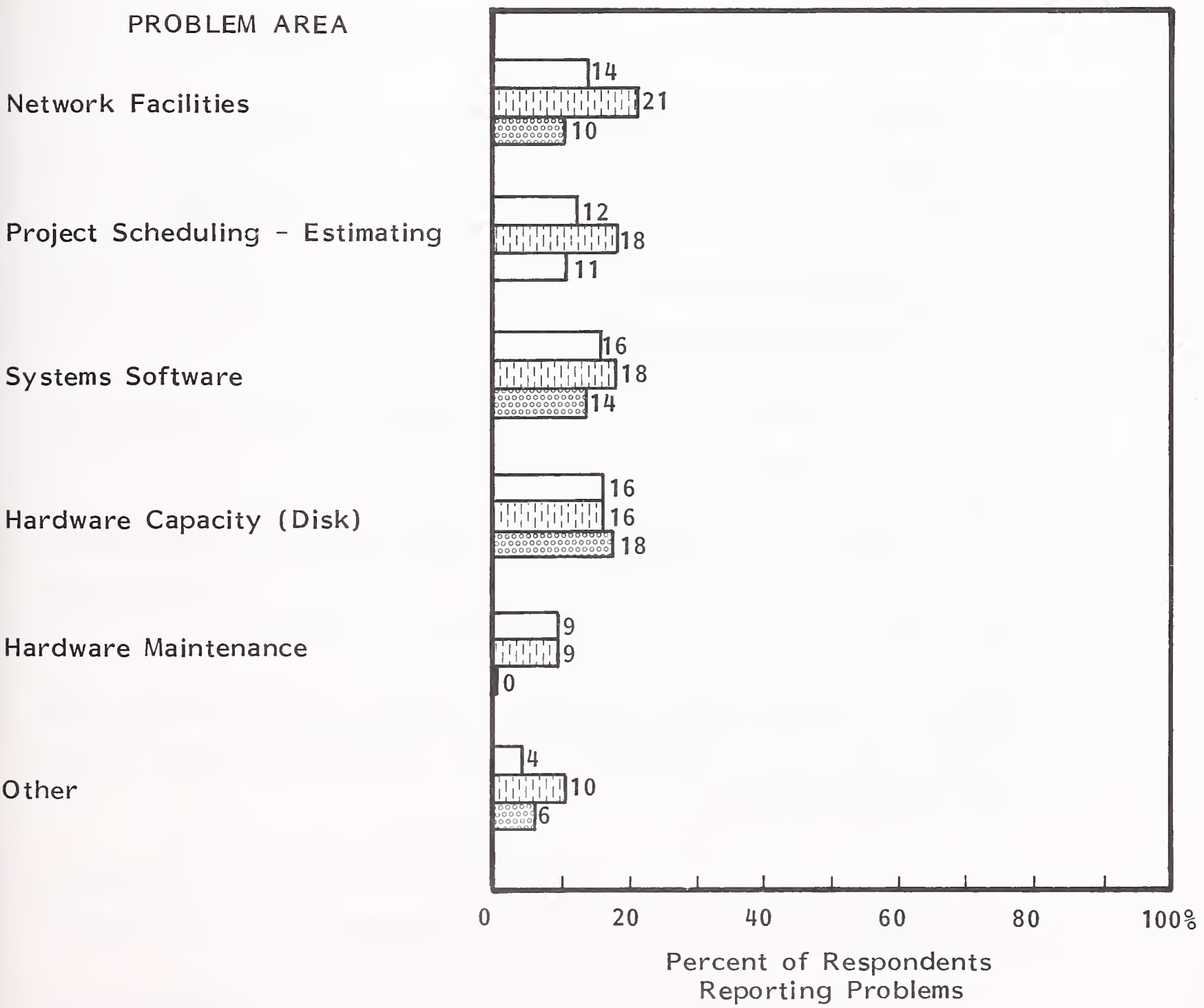
EXHIBIT III-7 (CONT.)

EDP PROBLEMS AND PLANNED CORRECTIVE ACTION (ALL SECTORS)



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- Of the top six occupations with the greatest job opportunities during the 1980s, five are computer related, and the Labor Department projects the following increases in job openings:

  - Computer service representatives 148%-173%
  - Computer systems analysts 108%-123%
  - Computer operators 88%-101%
  - Office machine service representatives 81%- 96%
  - Computer programmers 74%- 87%

- The likelihood that the demand for computer people will be filled by new entrants into the workforce is low.

  - The nation's population in the 16-to-24-year age group peaked at 36 million in 1980 after more than 20 years of growth.
  - By 1985, this age group will have declined 10%, and a further drop of 7% will occur between 1985 and 1990. By the end of the decade the expected size of this age group will be only 30 million.

- INPUT believes that personal computers and distributed data processing have the potential to play a major role in solving the productivity problem, but the timing is touch-and-go.

  - An increasing number of high school and elementary school graduates possess at least rudimentary programming skills in the BASIC language.
  - The familiarity of non-EDP personnel with their own applications areas suggests that, given adequate control measures and a satisfactory level of advice when needed, many of the burdens of setting implementation

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priorities and designing acceptable EDP solutions can be successfully shifted to end users.

- It remains incumbent upon IS management, however, to insure that corporate data integrity is maintained and that local computer initiatives meet overall return on investment (ROI) objectives. Failure to do so before adopting these "solutions" will result in chaos.

2. SYSTEM DEVELOPMENT

- The development of on-line systems and related data base systems are EDP departments' highest technological priorities, and related problems - hardware capacity and systems development specifications - are considered relatively minor.

  - INPUT's conclusion is that information systems directors feel they have by and large achieved a satisfactory measure of control over the technological aspects of their on-line operations.

  - Hardware capacity concerns appear to arise mainly from dependencies related to vendors' ability to meet delivery commitments.

  - However, the complexity of planning in a spontaneous demand, distributed environment has yet to be faced by most organizations, and this area will become an increasingly difficult problem over the next two to three years.

3. MANAGEMENT RELATIONS

- A key concern appears to be the ability of IS management to integrate the long-range IS plan with corporate business plans.

  - Long-range business objectives and long-range IS objectives are among the five most frequently mentioned problems, but the integration of the

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two are not viewed as receiving significant management attention until 1983.

- Based on the responses to the question about EDP problems, more than three-fourths of those identifying the setting of long-range IS objectives as a priority problem already have a plan for defining these objectives, and roughly two-thirds of those identifying long-range business objectives as a problem have a plan to cope with the problem.

- The proportion reporting management relations as a problem (roughly one in four) may be doing so because of difficulties in integrating business and IS objectives.

- Problems with personnel productivity (40%), personnel retention (32%), and personnel recruiting (30%) suggest that part of the problem of defining objectives may be related to uncertainties regarding manpower availability over the intermediate to long term.

4. END-USER RELATIONS

- Relations with end users are in need of improvement. IS management assigns a high priority to improving these relations, as shown in their list of plans. However, the seventh most frequently mentioned problem for 1981 is setting priorities for scheduled projects.

  - The inability to satisfy end-user needs likely has a great deal to do with end-user dissatisfaction; based on the responses, it is traceable to the inadequacy of personnel resources to respond to end-user needs.

5. THE MAGNITUDE OF THE PERSONNEL PROBLEM

- Exhibit III-8 shows the population distribution by position, and the vacancy rates by position, for respondents in all industry sectors.

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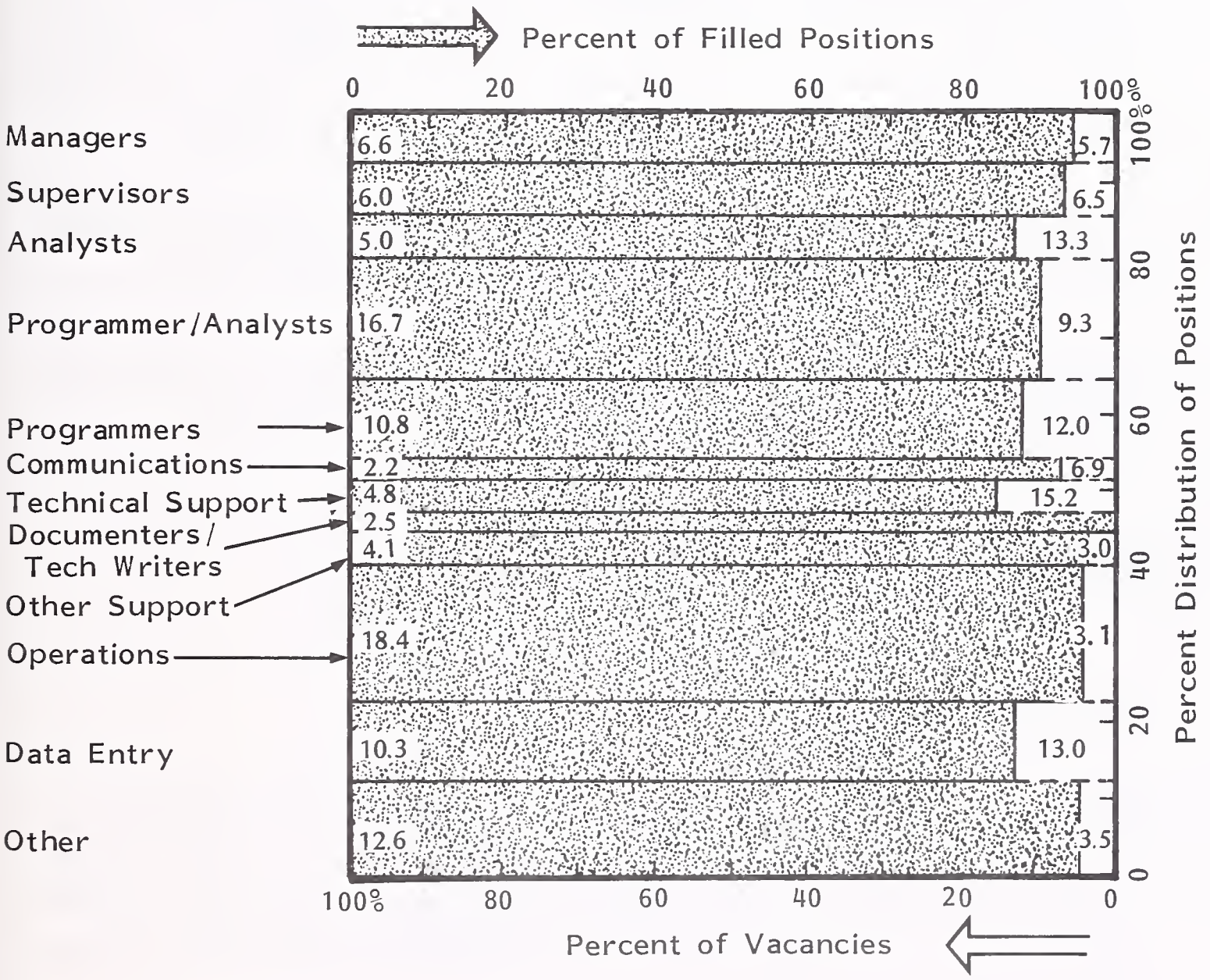
EXHIBIT III-8

POSITION DISTRIBUTION AND VACANCY RATE (ALL SECTORS)



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- The vacancy rate shown represents the percentage of authorized job openings that remain unfilled. Thus, for example, for every 100 programmer positions that are budgeted, only 88 are staffed.

- Weighting the vacancy rate according to the population distribution, the most severe shortages are for programmer/analysts, data entry personnel, and programmers.

- The severest shortages of management and supervisory personnel were reported in the process manufacturing and distribution sectors. The vacancy rate for managers is 12% in the process manufacturing sector, while the distribution sector reports that 13% of supervisory positions are open.

- The government sector's requirement for communications specialists is 27% unfilled, coupled with a vacancy rate for programmer/analysts of 24%.

- Job openings for operations personnel is minor in all industries except in the government sector, where 20% of the available positions are unfilled.

C. OTHER ISSUES

1. OPERATIONS PROFILE

- Eighty-five percent of the participants in this year's survey responded to a question asking whether the EDP operation is a cost center or a profit center. All those who responded indicated that the EDP department is a cost center, and it is fair to assume that only a small percentage of those not responding may be set up as profit centers.

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- When asked how they allocated costs, 55% cited resource usage. Transaction volume is the basis with 7% of the respondents, while user size determines cost allocation in 2.5% of the cases. Other methods are used by 14% of the sample.

- Exhibit III-9 shows the distribution of computer resource usage for all sectors.

  - The utilities sector reports the lowest proportion of resources used for production (50%), the highest proportion for program maintenance at 20%, and the second highest percentage, 23%, devoted to systems development.

  - The greatest percentage reported for production is in the transportation sector, at 72%, because the majority of airline transportation systems support applications must operate around the clock seven days a week.

  - The services and other sector has the highest (25%) proportion for systems development, reflecting the orientation of this industry group.

  - Although the industry wide proportion for other uses is 3%, and the proportion of such uses tends to cluster around this low figure in most industry sectors, the education sector shows a disproportionately high percentage of 15%.

- Eleven percent of all respondents indicated that they have one or more computers dedicated exclusively to supporting program development efforts. However, no correlation appears to exist between the use of dedicated applications development computers and the proportion of total resources allocated to development.

- Exhibit III-10 shows how this year's panel responded to an inquiry into the status of the integration of data processing and word processing.

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EXHIBIT III-9

DISTRIBUTION OF COMPUTER RESOURCE USAGE (ALL SECTORS)

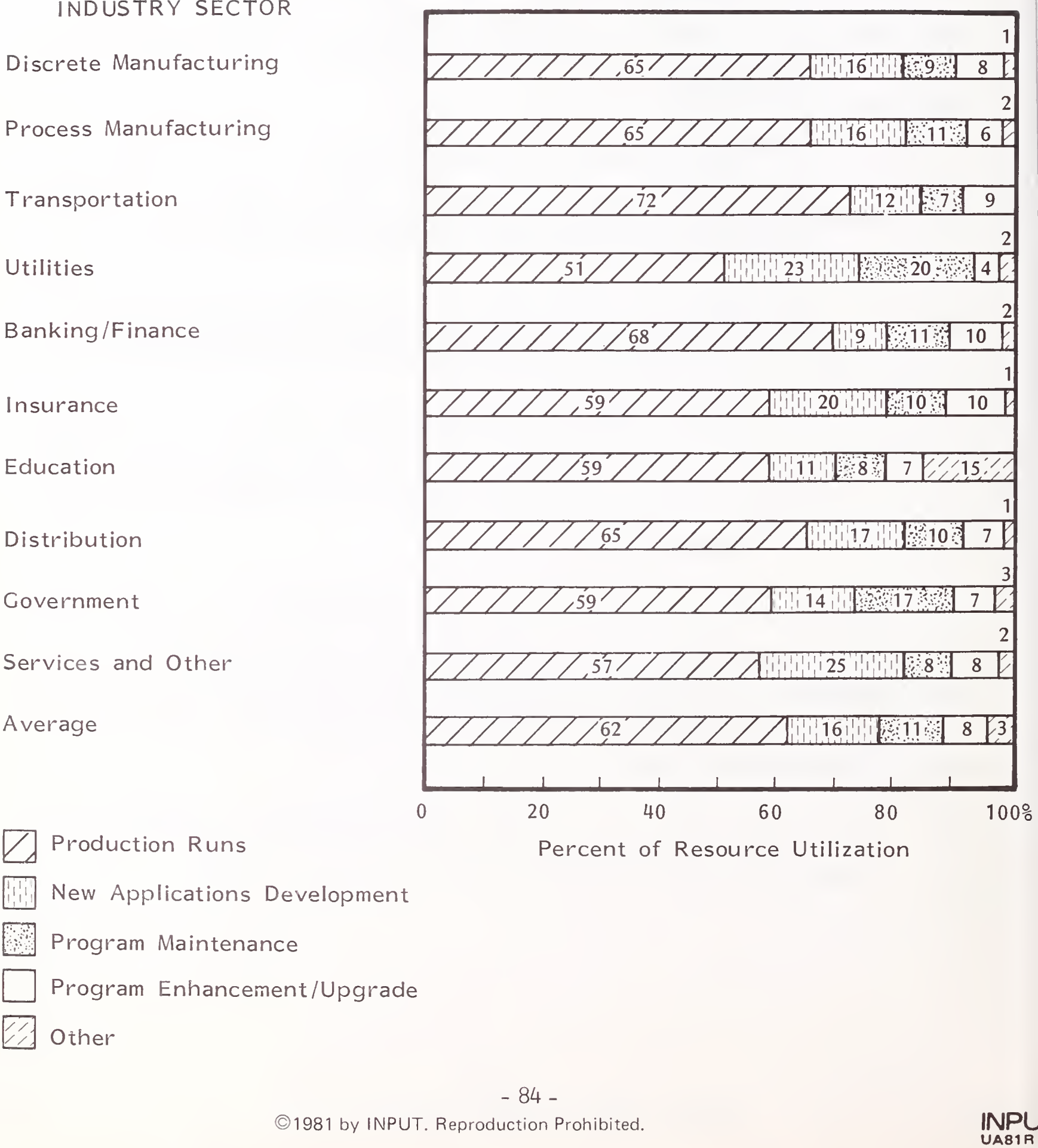

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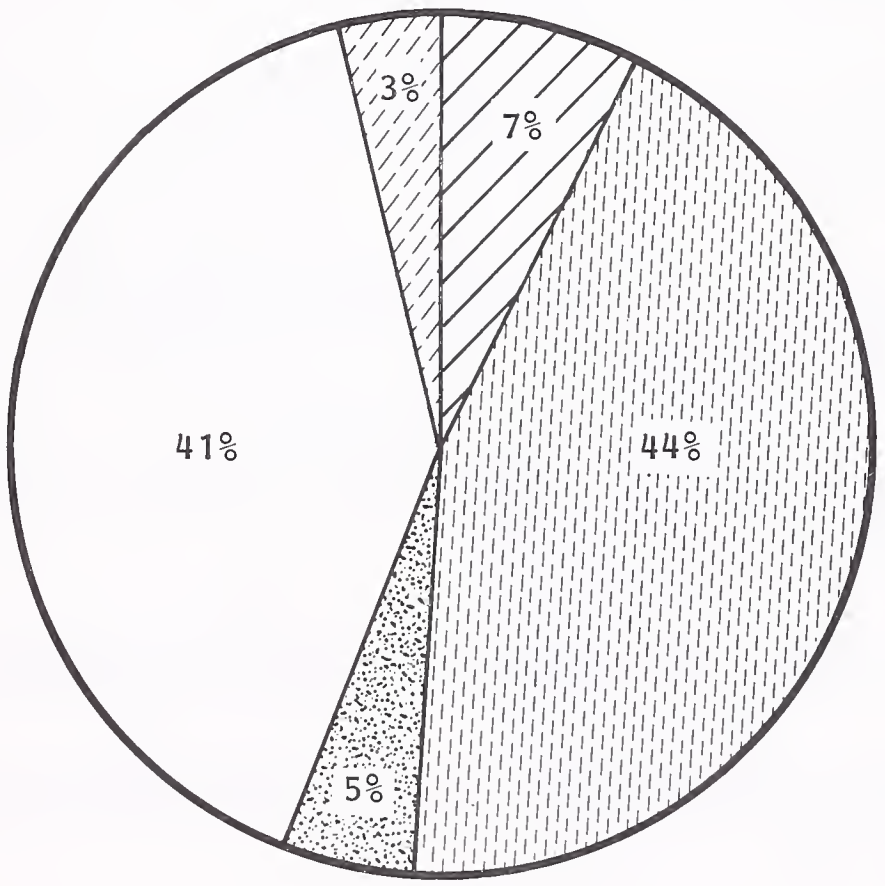
EXHIBIT III-10

STATUS OF EDP INTEGRATION WITH WORD PROCESSING



WORD PROCESSING

STATUS

- Done
- Plan to do
- Will not do
- Undecided
- No Response

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- Only 7% of all respondents indicated that this integration is complete. Greatest progress is shown in the education and process manufacturing sectors.

- Progress toward integrating CAD/CAM with data processing is even slower, as shown in Exhibit III-11. Respondents reporting completion represented 4% of the total.

  - As may be expected, almost half of those stating that this integration is complete are in the discrete manufacturing sector. The rest are in the education, utilities, government, and service sectors.

- A tabulation of the types of EDP resources sold by respondents to others appears in Exhibit III-12.

  - Less than one in five respondents markets EDP resources outside the organization.

  - The transportation and utilities sectors deal only with their own organizations.

  - Less than 4% market access to proprietary data bases.

2. THE INFORMATION SYSTEMS DEPARTMENT'S ROLE IN OFFICE AUTOMATION

- Exhibit III-13 is a tabulation of responses to questions inquiring into the status of key components of the office of the future, and Exhibit III-14 shows IS management responsibility for these components.

  - It is disconcerting to note that, in most cases, only about half the respondents indicate that the IS department has management responsibility for these components.

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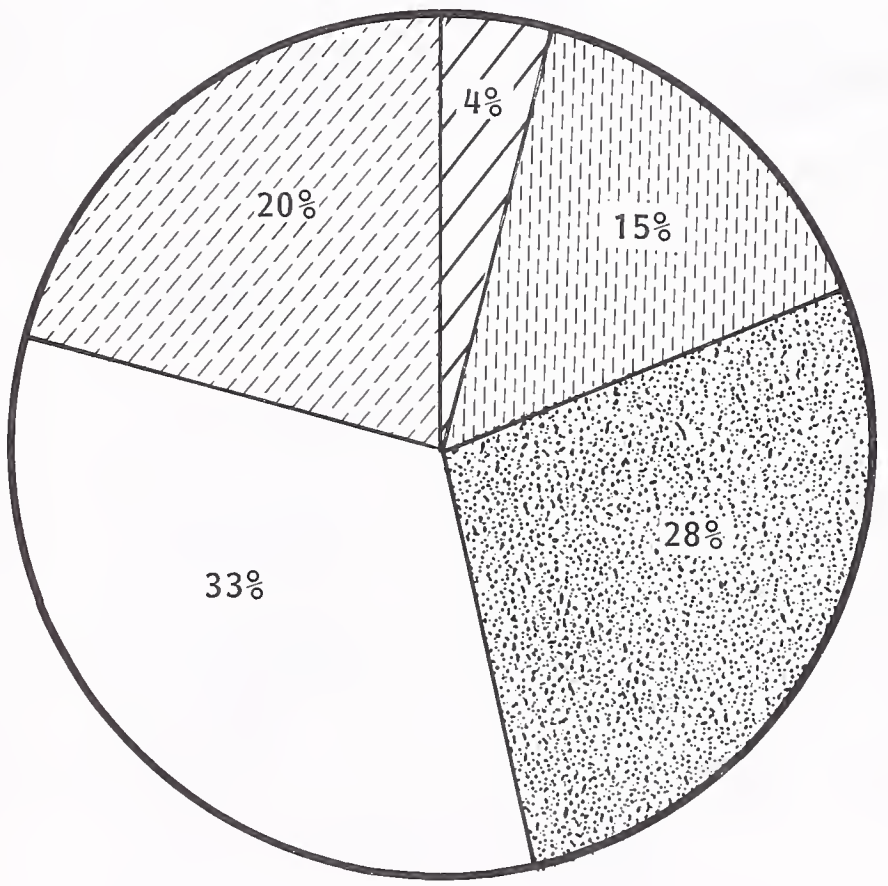
EXHIBIT III-11

STATUS OF EDP INTEGRATION WITH CAD/CAM



CAD/CAM

STATUS

- Done
- Plan to do
- Will not do
- Undecided
- No Response

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EXHIBIT III-12

SALES OF EDP RESOURCES OUTSIDE OF OWN ORGANIZATIONS

MODE OF OPERATION	PERCENT OF RESPONDENTS
Batch Processing	19.2%
On-Line Processing	12.1
TYPE OF RESOURCE	
Raw Computer Time	6.7
Processing of Customers' Data	11.3
Access to Proprietary Data Base	3.8
Retainer for System Backup	7.5
Sales of Internally Developed Programs	6.7
Rental of Internally Developed Programs	3.3

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EXHIBIT III-13

STATUS OF OFFICE AUTOMATION COMPONENTS

COMPONENT	STATUS	NO PLANS	DON'T KNOW*
Intracompany Electronic Mail	13 / 21 / 10	47%	9%
Communicating Word Processors	28 / 35 / 9	20	8
Video Conference Freeze Frame	2 / 6 / 3	69	20
Video Conference Full Motion	2 / 4 / 5	69	20
Sub-Minute FAX	9 / 7 / 7	55	22
Intrabuilding Wideband	4 / 8 / 9	55	24
Intracity Wideband	4 / 6 / 7	59	24
Earth Stations	2 / 5 / 5	66	22
Computerized PBX	27 / 17 / 6	33	27
Auto Network Management Systems	9 / 13 / 13	42	23
Worldwide Data Communications	5 / 3 / 3	67	22
Private Packet Transmission (X.25)	3 / 8 / 4	62	23

0 20 40 60 80%

Cumulative Percent of Respondents

Now

1981-1983

1984-1986

* INCLUDES NO RESPONSE

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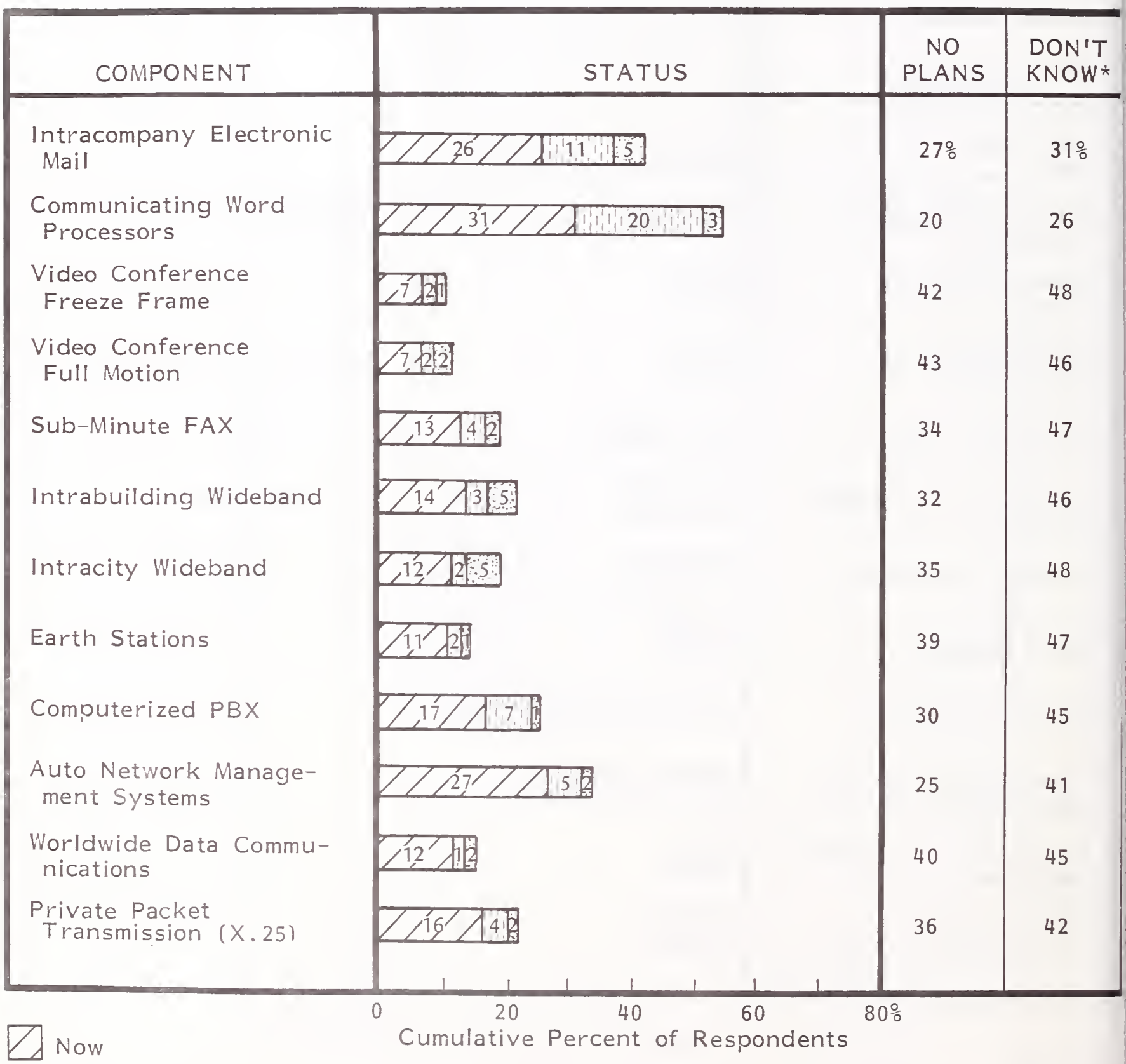
EXHIBIT III-14

INFORMATION SYSTEM RESPONSIBILITY FOR OFFICE AUTOMATION COMPONENTS



* INCLUDES NO RESPONSE

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- Only in the case of electronic mail and communicating word processors does the proportion rise as high as three-quarters of the respondents; but of these, 20-25% have no plans to do anything.

- In the other cases, there is much less involvement as yet. Migration from traditional office communications systems to newer systems appears likely to follow a cautious approach.

  - With the exception of communicating word processors, intracompany electronic mail, computerized PBXs, and automatic network management systems, penetration of listed component areas is not expected to exceed 15% to 20% over the next five years, at least according to the IS managers who responded to this questionnaire.

  - Compared to last year's sample, however, the proportion of respondents reporting the use of intracompany electronic mail has risen dramatically from 7% to 13%.

  - INPUT views this occurrence with mixed feelings. In the case of a number of organizations, the impetus to install these systems appears strongly to be the "me too" syndrome, rather than a true analysis of needs and costs. Electronic mail and office information systems in general will be examined closely by INPUT during the next year to try to identify the justification parameters involved.

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IV INDUSTRY SECTOR ANALYSIS

IV INDUSTRY SECTOR ANALYSIS

A. INDUSTRY SECTOR BUSINESS OUTLOOK FOR 1982

- The Reagan administration's tax, budget, and national defense programs appear to set the stage for a nominal increase of roughly 8% in the U.S. gross national product to $3.1-$3.2 trillion in 1982 from an estimated $2.9 trillion in 1981.

  - Against this background, the requirements for applications aimed at improving corporate productivity set the stage for information systems in virtually every sector.

- Earlier, more ambitious forecasts were progressively tempered through the last half of 1981, and median projections now appear to be the maximum that can be expected in most industry sectors.

  - Gains are more likely to be related to individual corporate circumstances and opportunities, than to industrywide factors and events.

  - Downward budget adjustments and/or spending restraints, on the other hand, appear to be a more widespread occurrence.

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- In summary, 1982 appears to be shaping up as a cautious year, with continuing emphasis on cost containment, or modest growth only if proposed applications can show distinct and rapid cost benefits.

  - These may be easier to demonstrate for local, personal computer applications than for large-scale, corporatewide initiatives.

B. DISCRETE MANUFACTURING

1. INDUSTRY SECTOR OVERVIEW

- The discrete manufacturing sector includes the apparel, furniture, printing, leather, fabricated metal products, machinery, equipment, instrument, and miscellaneous manufacturing industries as defined by SIC codes 23, 25, 27, 31 and 34 through 39. This industry sector includes companies that manufacture products sold as units (e.g., automobiles and calculators) rather than bulk products such as petroleum or cement. Of the total INPUT survey, 20.7% of the respondents are in this industry sector.

- The discrete manufacturing sector contributes 15% of the U.S. gross national product, but accounts for 26.1% of spending on information systems. This sector is likely to grow at the long-term average rate of 12% in information systems expenditures through 1985, but some subsectors such as instrumentation, electronics products, and electronics-based components will exceed this rate by a considerable margin, experiencing a compound growth rate of 16% until at least mid-decade, while the automotive subsector will lag at about 10% growth per year.

- The sector is a somewhat homogeneous grouping of subsectors, but characteristics of marketing, management style, and position in the supply/demand chain imply varying levels of information technology implementation within each subsector.

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- To the extent that information systems technology is considered to include computer-aided design/computer-aided manufacturing (CAD/CAM) and robotics, the discrete manufacturing sector will see rapidly changing growth in information systems during the next five years.

  - Particularly in the automotive, electronics, and aerospace subsectors, CAD/CAM has been a way of life for several years.

  - The increasing use of robotics has produced strong dislocations in employment patterns that will continue throughout the 1980s.

- A descriptive profile of the discrete manufacturing sector respondents is provided in Exhibit IV-1.

  - As noted in the cross-industry analysis section, inflation has pushed the demarcation line between emerging and mature organizations upward from $100 million in sales to about $250 million.

  - Figures reported are similar to 1980 after compensating for differences in the sample composition, except that there is a reported higher proportion of EDP employees to total employees.

- Average expenditures for information systems remained at the 1.5% of sales level for both large and small respondents, but weighted figures would show much higher amounts spent by the larger firms, nearer to 2.3% of sales for this group.

2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit IV-2 shows a distribution of EDP budgets that is similar in shape to the 1980 distribution. Most respondents cluster around 1% of sales, but a significant percent show budgets in the over 2% range.

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EXHIBIT IV-1

RESPONDENT PROFILE - DISCRETE
MANUFACTURING SECTOR

PROFILE CHARACTERISTIC	SURVEY AVERAGES BY COMPANY SIZE IN SALES	
	$249 MILLION OR LESS	$250 MILLION OR MORE
Annual Sales ($ millions)	$ 79	$ 1,435
Total Employees	988	17,108
EDP Employees	20	464
EDP Employees as Percent of Total Employees	2.0%	2.7%
EDP Budget ($ Thousands)	$ 985	$32,884
EDP Budget as Percent of Annual Sales	1.5%	1.5%
EDP Budget per EDP Employee	$50,289	$57,333
EDP Budget per Employee	$ 983	$ 1,358

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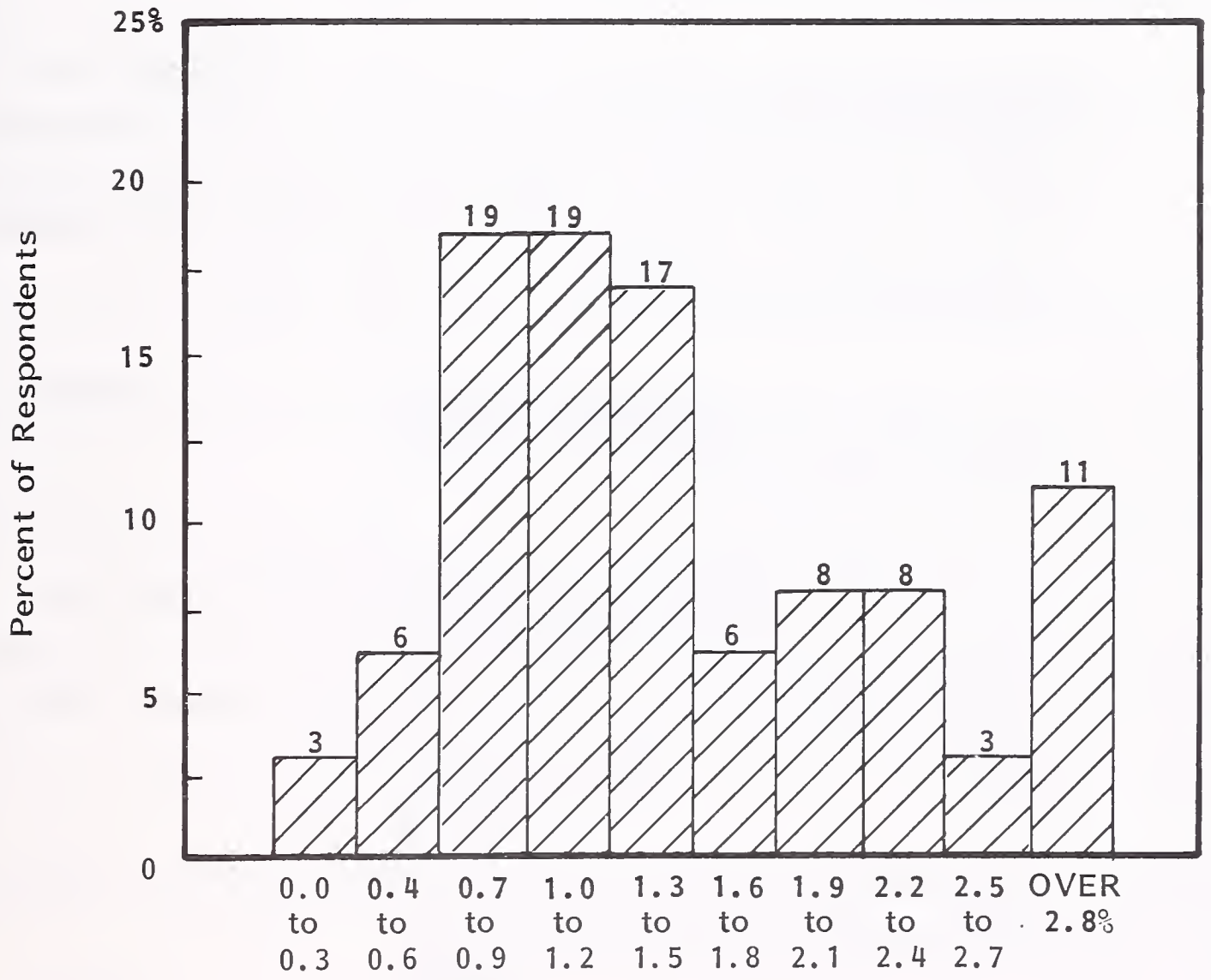
EXHIBIT IV-2

RATIO OF EDP BUDGET TO COMPANY SALES:
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE
DISCRETE MANUFACTURING SECTOR



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- Over 70% of respondents in the discrete manufacturing sector reported a 10% or greater increase in their 1981 budgets over the 1980 figure, with smaller organizations reporting the higher percentages of increase.

  - For 1982, the figure drops to 60% of respondents who are asking for increases of 10% or more, as shown in Exhibit IV-3.

- Exhibit IV-4 shows the averages of EDP budget items in the discrete manufacturing sector. No respondent indicated that all listed items were included in the EDP budget. Therefore, the column labeled "percent reporting" is essential in interpreting the data presented.

  - Salaries of EDP personnel remained the largest single budget item, with respondents who furnished a breakdown indicating that salaries average 42.3% of the budget. This proportion is slightly lower for the smaller companies, where it averaged 40.5%, than for the larger companies where salaries comprised 44% of the total EDP budget.

  - At the most, 8% of respondents reported budgetary responsibility for remotely located computers or peripherals.

  - Decentralization of budget authority is strongly indicated by the proportion of respondents reporting expenses for terminals (5.7%) and network expenses (4.2%). Roughly half of all industry respondents explicitly reported that these two items are not included in the EDP budget.

  - EDP departments in this sample reported minimal specific budgets for microcomputers or personal computers.

  - Data security and disaster planning appear to be neglected areas. Less than one-seventh of respondents reported expenditures for these items, and these indicated that less than 1% of the EDP budget was allocated for either.

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EXHIBIT IV-3

ACTUAL AND PLANNED EDP BUDGET GROWTH FOR RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR

DEGREE OF BUDGET CHANGE	PERCENT OF RESPONDENTS
Negative/No Change	13 / 0
Less than 10% Increase	16 / 36
10% to 20% Increase	38 / 36
20% to 30% Increase	28 / 18
Greater than 30% Increase	6 / 10

0 20 40 60 80 100%

1980-1981

1981-1982

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EXHIBIT IV-4

BREAKDOWN OF INFORMATION SYSTEMS BUDGET IN THE DISCRETE MANUFACTURING SECTOR

BUDGET CATEGORY	AVERAGE AMOUNT ($ Thousands)	REPORTED		1982 FORECAST ($ Thousands)	PERCENT CHANGE
		PERCENT OF BUDGET	PERCENT REPORTING*		
Salaries	$4,365	42.3%	84.0%	$4,862	+ 11.4%
EDP Training	41	1.4	68.0	44	+ 7.3
Non-EDP Training	66	1.1	10.0	71	+ 7.6
Central Site Mainframes	1,888	18.4	70.0	2,382	+ 26.2
Central Site Peripherals	272	11.0	44.0	290	+ 6.6
Remote Site Mainframes	1,001	7.8	10.0	1,421	+ 41.9
Remote Site Peripherals	192	5.4	18.0	193	+ 0.5
Minicomputers	2,198	12.2	24.0	2,823	+ 28.4
Microcomputers/Personal Computers	5	0.3	2.0	10	+100.0
Terminals	772	5.7	50.0	828	+ 7.3
Communications Hardware and Software	485	2.4	50.0	543	+ 11.9
Network Expense	4,647	4.2	44.0	5,176	+ 11.3
Other Software	273	5.9	46.0	288	+ 5.4
Vendor Maintenance	90	5.3	56.0	97	+ 7.8
Third-Party Maintenance	73	2.9	14.0	79	+ 8.2
Outside Services	611	5.4	18.0	667	+ 9.1
Data Security	135	0.7	14.0	123	- 8.8
Disaster Planning	10	0.4	14.0	11	+ 10.0
Supplies	334	8.2	80.0	380	+ 13.8

*16% OF RESPONDENTS DECLINED TO FURNISH BUDGET LINE ITEM DETAILS.

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- Sixty-three percent of industry respondents indicated specific budget allocations for equipment maintenance - either vendor or third-party maintenance, or both - suggesting a high propensity for equipment purchase in the industry.

- A comparison of the raw and adjusted figures for network expense and minicomputer purchases shows that, with the exception of a few large users, EDP departments are largely concerned with traditional central site equipment.

3. MAJOR PLANS AND PROBLEMS

- IS managers' concerns in the discrete manufacturing sector are focused on three principal areas. Exhibits IV-5 and IV-6 show how respondents rank their plans and problems, respectively. The percentages shown represent industry sector IS managers' identification of each category as included in their top five priorities.

  - In the technological development area, the development and modification of on-line systems and related data base systems remain the major concerns. The long-term nature of these concerns is reflected in the priorities assigned to these plans through 1983.

  - Plans and problems of a general management nature deal primarily with the strategic concern of defining long-range IS objectives consistent with those of the business, and improving the productivity of departmental personnel.

  - Politically, respondents indicate that the area of relations with end users continues to warrant improvement. By contrast, relations with upper management appear largely to be satisfactory.

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EXHIBIT IV-5

EDP PLANS FOR RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR

(Percent)

PLAN	ON 1981 AGENDA	RANKED FIRST 1981	ON 1982 AGENDA	RANKED FIRST 1982	ON 1983 AGENDA	RANKED FIRST 1983
Develop On-Line Systems	66.0%	8.0%	68.0%	20.0%	36.0%	4.0%
Modify On-Line Systems	46.0	8.0	40.0	8.0	44.0	14.0
Develop Data Base Systems	48.0	10.0	38.0	12.0	28.0	12.0
Modify Data Base Systems	22.0	6.0	16.0	4.0	30.0	12.0
Develop DDP Network	14.0	2.0	18.0	4.0	16.0	6.0
Modify DDP Network	16.0	4.0	26.0	2.0	22.0	8.0
Install Word Processing	10.0	0	12.0	2.0	10.0	2.0
Integrate Word Processing and Data Processing	4.0	0	22.0	2.0	22.0	4.0
Develop Long-Range EDP Plan	24.0	10.0	18.0	0	14.0	0
Revise Long-Range EDP Plan	20.0	6.0	30.0	6.0	28.0	0
Integrate EDP Plan with Business Plan	32.0	10.0	40.0	8.0	36.0	10.0
Improve EDP Personnel Productivity	50.0	4.0	44.0	4.0	38.0	6.0
Measure EDP Personnel Productivity	20.0	8.0	14.0	4.0	24.0	6.0
Convert Hardware System	18.0	2.0	8.0	6.0	2.0	0
Convert Operating System	14.0	8.0	10.0	8.0	6.0	0
Develop New Batch Applications	2.0	0	10.0	2.0	4.0	2.0
Integrate Batch Applications	16.0	2.0	8.0	0	8.0	0
Improve End-User Relations	32.0	4.0	32.0	2.0	38.0	0
Other	12.0	4.0	8.0	2.0	0	0

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EXHIBIT IV-6

EDP PROBLEMS FOR RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR

(Percent)

PROBLEM	MEN-TIONED 1980	RANKED FIRST 1980	MEN-TIONED 1981	RANKED FIRST 1981	PLAN IN PLACE
Long-Range Business Objectives	26.0%	12.0%	38.0%	14.0%	22.0%
Long-Range EDP Objectives	40.0	12.0	46.0	18.0	30.0
Relations with Management	20.0	4.0	20.0	0	10.0
Relations with End Users	40.0	10.0	42.0	10.0	24.0
Data Center Operations	14.0	2.0	12.0	2.0	18.0
Project Planning	28.0	8.0	28.0	4.0	24.0
Project Scheduling - Estimating	20.0	0	28.0	2.0	18.0
Project Scheduling - Priorities	26.0	2.0	34.0	4.0	30.0
System Development Specifications	20.0	2.0	26.0	8.0	16.0
EDP Budget	20.0	2.0	18.0	0	12.0
Personnel Recruiting	28.0	4.0	36.0	10.0	16.0
Personnel Training	20.0	6.0	22.0	0	18.0
Personnel Retention	18.0	4.0	30.0	8.0	14.0
Personnel Productivity	30.0	4.0	44.0	8.0	26.0
Hardware Capacity (CPU)	32.0	10.0	20.0	4.0	24.0
Hardware Capacity (Disk)	18.0	2.0	8.0	0	14.0
Hardware Maintenance	8.0	0	6.0	0	10.0
System Software	16.0	0	12.0	2.0	14.0
Network Facilities	10.0	2.0	20.0	2.0	12.0
Other	0	0	10.0	4.0	6.0

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- In none of the major areas of concern do IS managers appear to have adequate plans to cope with the situation. Generally, plans lag problems by about a year.

- By contrast, IS managers appear to have the areas of batch applications, data center operations, and hardware and software system conversions well under control.

- The problem of maintaining and improving end-user relations appears to be related to problems in defining and establishing project priorities. User departments tend to view the EDP department as a service organization, and difficulties in communicating the differing nature of departmental priorities tend to lead to misunderstandings. Concurrency of these two particular problems appears more pronounced in larger firms.

4. KEY ISSUE STATUS REVIEW

- Priority applications currently under development in the discrete manufacturing sector are largely accounting and general-purpose applications.

  - Of the five most frequently mentioned development priorities, only two - materials requirement planning and shop floor control - are industry specific and manufacturing oriented.

  - CAD/CAM ranked sixth in frequency of mentions, along with billing and cost accounting.

    . In a separate question regarding the status of CAD/CAM integration with data processing, 8% reported that this integration has been accomplished, and another 36% stated that they plan to integrate the two.

    . One-third of those intending to integrate CAD/CAM with data processing plan to do so in 1981.

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- The diversity of applications mentioned indicates that firms in this sector are increasingly automating operational areas of the business.

  - While accounting and financial reporting applications dominate applications objectives, computer support of management planning functions is indicated by mentions of pricing, capacity planning, project control, and performance modeling applications.

  - Direct support of manufacturing functions is provided by the following named applications:

    . Materials requirement planning.

    . Shop floor control.

    . On-line receiving.

    . Materials inventory.

    . Quality assurance.

    . Production control.

    . Warehouse receiving.

    . Procurement.

    . Scrap control.

    . Tooling inventory.

    . Work-in-process analysis.

  - The following applications automate manufacturing support functions:

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  - . Equipment maintenance.
  - . Facilities management.
  - . Service call dispatching.
- Support of marketing and sales functions is provided by:
  - . On-line credit search.
  - . Branch office systems.
  - . Proposal estimate development.
  - . Order management.

- The discrete manufacturing sector reports the highest percentage of on-line applications in its development priorities at 70%, nine percentage points higher than the 61% average for all sectors.
  - Additionally, 32% of these applications are designed to support remote sites on-line. This is seven percentage points higher than the cross-industry average, and is exceeded only by the distribution sector and transportation.
  - Commitment to distributed processing networks is suggested by the fact that 14% of priority applications are intended to operate in batch mode at remote sites but transmit summary data to the central site. This percentage is exceeded only by the 17% reported by the distribution sector.

- The percentage of respondents indicating the use of telecommunications systems today is 71%, slightly below the cross-industry average, while a higher than average 10% plan to begin to use telecommunications within three years.

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- In the discrete manufacturing sector, the average number of sites linked by telecommunications lines is three. Respondents plan to add an average of four sites in 1982 and three in 1983.

- The reported range varies widely, however, from a telecommunications system supporting one location to a 75-site network that is forecast to grow at a compound annual rate of 27% to 120 locations by year end 1983.

- The average number of terminals supported full-time per system is 154, but spans a range of 2 to 4,000. Part-time support is provided for an average of 76 terminals per system as well, and this average covers a range from 2 to 600 terminals.

- The discrete manufacturing sector's commitment to IS support of office-of-the-future components appears generally to exceed that of the user community.

  - Focusing on the 1981-1983 period, the sector's use of electronic mail, subminute facsimile, video conferencing, intrabuilding wideband transmission, private packet transmission, and worldwide data communications is relatively much greater than in other sectors.

  - The proportion indicating EDP management responsibility for communicating word processors, videoconferencing, worldwide data communications, and private packet transmission is substantially larger than that for the cross-industry average.

  - The discrete manufacturing sector generally reports a higher level of EDP management responsibility for office-of-the-future components than any other industry sector with the exception of distribution.

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C. PROCESS MANUFACTURING

1. INDUSTRY SECTOR OVERVIEW

- This industry sector includes SIC categories 10 through 13, 20, 21, 22, 24, 26, 28, 29, 30, 32, and 33. The output of this industry sector tends to be sold in volume measures (petroleum, food, and cement) rather than in unit measures (automobiles, calculators) as would be typical of the discrete manufacturing sector.

- The process manufacturing sector accounts for 25.7% of U.S. gross national product but employs only 7.8% of the nation's non-agricultural workforce. INPUT projects the revenue growth of this sector at 10.6% in 1981 and 9.2% in 1982.

- The process manufacturing sector accounts for an estimated 13.5% of domestic EDP expenditures, at $6.8 billion in 1981. This sector is likely to grow above the national average rate in information systems over the next several years.

  - The major driving factors wll be the energy companies, which are already responsible for the largest data bases and most massive installations of computing power.

- The petroleum subsector includes some of the most sophisticated technical applications of computers, and its applications are typified by a need to process and store huge amounts of data.

  - Its general business systems tend to be somewhat less complex than in discrete manufacturing, because product lines are shorter and customer transactions are fewer at higher dollar volumes per transaction.

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- The major exception is the processing of credit card transactions.

- However, the level of government regulation and associated reporting requirements has tended to be higher than for the other subsectors.

  - Some relief may be forthcoming as a result of recent moves to deregulate the subsector.

- Exhibit IV-7 portrays the information systems profile of the process manufacturing sector.

  - For the larger companies in this sector, EDP budgets decline as a percent of sales, but increase significantly in dollars per employee, dollars per EDP employee, and number of EDP employees as a percentage of total employees.

2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit IV-8 shows a distribution of EDP budgets in the process manufacturing sector, with all reported budgets under 1.5% of sales.

  - As defined earlier, contrary to the pattern in most industry sectors, smaller companies have the larger budgets by percentage.

  - The average increase in EDP budgets in the process manufacturing sector was 16% in 1981. As shown in Exhibit IV-9, over three-quarters of the respondents reported increases in excess of 10% in 1981.

  - Roughly the same proportion projects gains exceeding 10% for 1982, but averaging closer to 10% than last year's 16%.

- Exhibit IV-10 shows the averages of individual EDP budget items in the process manufacturing sector.

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EXHIBIT IV-7

RESPONDENT PROFILE -
PROCESS MANUFACTURING SECTOR

PROFILE CHARACTERISTIC	SURVEY AVERAGES BY COMPANY SIZE IN SALES	
	$249 MILLION OR LESS	$250 MILLION OR MORE
Annual Sales ($ millions)	$ 146	$ 1,729
Total Employees	1,692	13,356
EDP Employees	23	244
EDP Employees as Percent of Total	1.4%	1.8%
EDP Budget (Thousands)	$ 882	$12,753
EDP Budget as Percent of Annual Sales	0.7%	0.6%
EDP Budget Per EDP Employee	$46,917	$52,333
EDP Budget Per Employee	$ 692	$ 1,368

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EXHIBIT IV-8

RATIO OF EDP BUDGET TO COMPANY SALES:
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE
PROCESS MANUFACTURING SECTOR

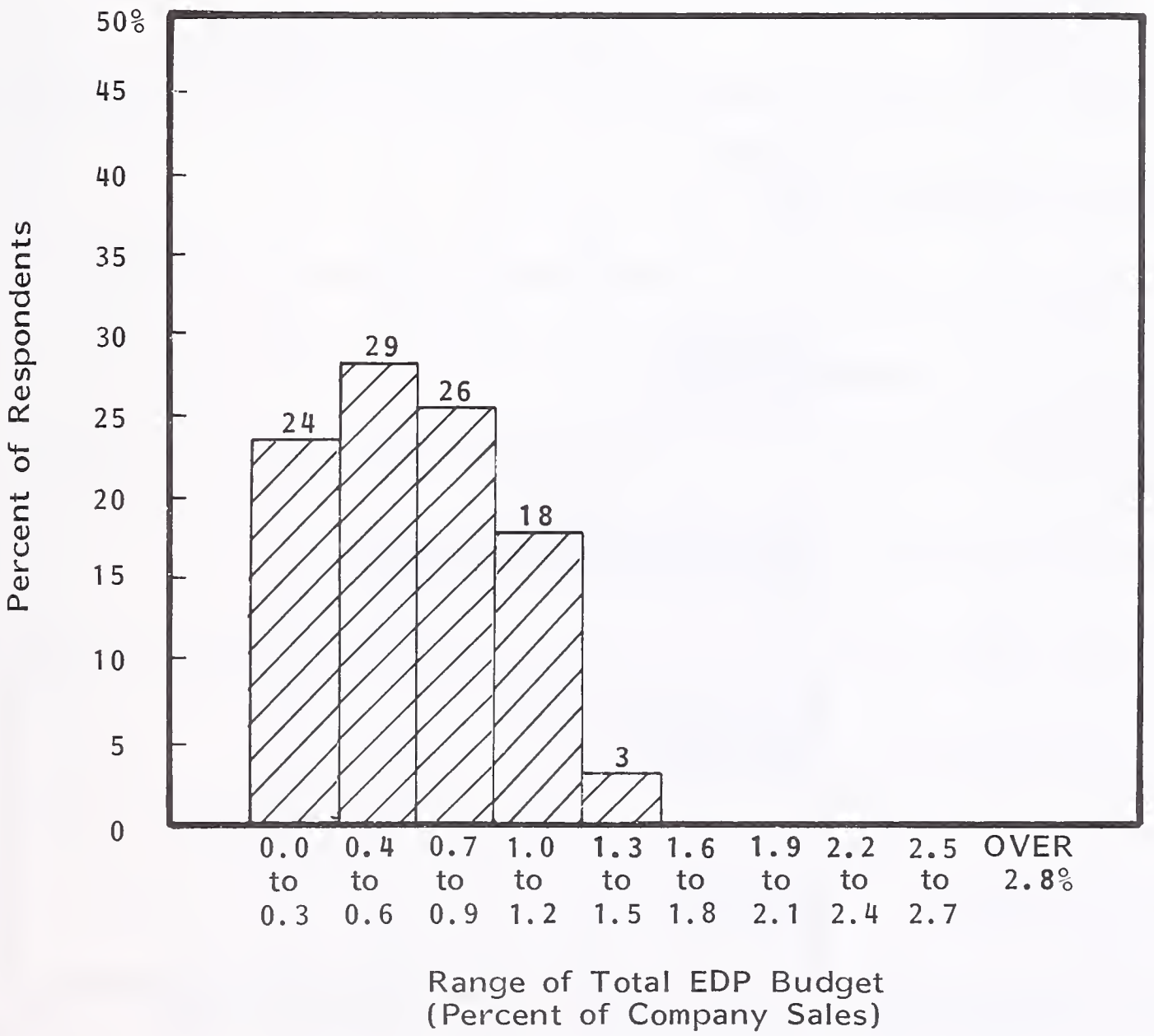

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EXHIBIT IV-9

ACTUAL AND PLANNED EDP BUDGET GROWTH FOR RESPONDENTS IN THE PROCESS MANUFACTURING SECTOR

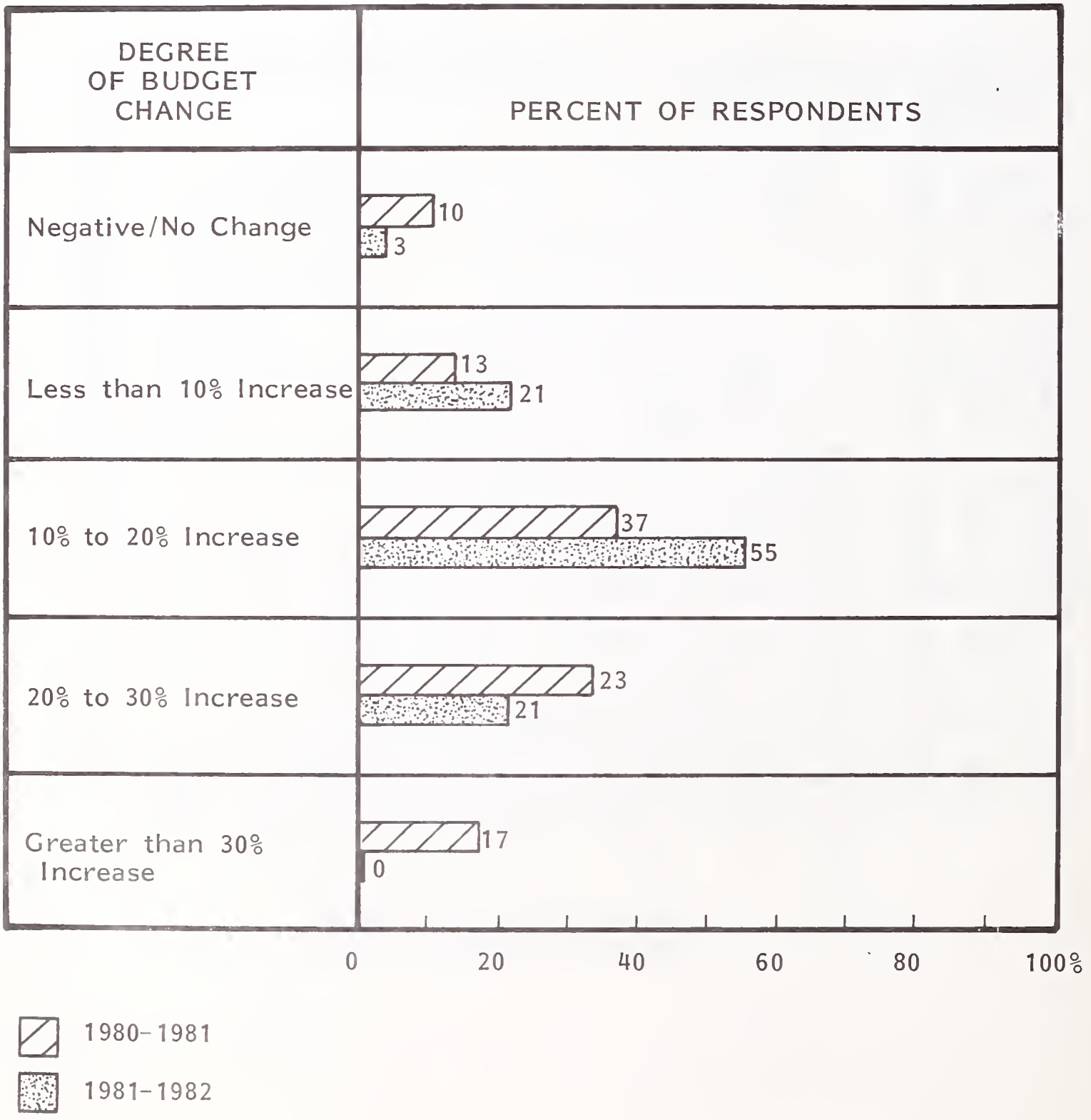

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EXHIBIT IV-10

BREAKDOWN OF INFORMATION SYSTEMS BUDGET IN THE PROCESS MANUFACTURING SECTOR

BUDGET CATEGORY	AVERAGE AMOUNT ($ Thousands)	REPORTED		1982 FORECAST ($ Thousands)	PERCENT CHANGE
		PERCENT OF BUDGET	PERCENT REPORTING*		
Salaries	$3,316	46.7%	83.3%	$3,659	+10.3%
EDP Training	30	1.6	66.7	32	+ 6.7
Non-EDP Training	8	1.3	13.3	9	+12.5
Central Site Mainframes	1,464	14.9	76.7	1,654	+12.9
Central Site Peripherals	321	13.0	43.3	341	+ 6.2
Remote Site Mainframes	255	3.6	13.3	271	+ 6.3
Remote Site Peripherals	35	2.0	10.0	39	+11.4
Minicomputers	138	10.5	23.3	178	+28.9
Microcomputers/Personal Computers	8	0.9	6.7	11	+37.5
Terminals	224	3.8	60.0	284	+26.7
Communications Hardware and Software	401	3.1	46.7	443	+10.4
Network Expense	185	3.4	46.7	180	- 2.7
Other Software	113	4.7	66.7	122	+ 7.9
Vendor Maintenance	106	4.6	70.0	121	+14.2
Third-Party Maintenance	24	2.7	16.7	30	+25.0
Outside Services	171	7.0	33.3	199	+16.3
Data Security	7	1.0	6.7	12	+71.4
Disaster Planning	11	0.7	10.0	12	+ 9.0
Supplies	544	8.3	83.3	595	+ 9.3

*17% OF RESPONDENTS DECLINED TO FURNISH BUDGET LINE ITEM DETAILS.

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- EDP salaries remained close to the overall average for this budget item at 46.7%.

- The process manufacturing sector is one of three sectors indicating IS budget responsibility for microcomputers or personal computers. Such spending from IS budgets, however, represents an insignificant proportion of the total spent on microcomputers.

- The small percentage of firms reporting budget responsibility for remotely located mainframes and peripherals suggests decentralized responsibility for distributed processing equipment.

- The purchased nature of the installed base in this sector is strongly suggested by the high (70%) proportion of respondents who indicated expenditures for vendor maintenance.

3. MAJOR PLANS AND PROBLEMS

- Long-range planning, on-line data base systems, personnel productivity, and end-user relations represent IS managers' primary concerns in the process manufacturing sector.

  - EDP personnel productivity is easily the most important and longest lasting concern. Exhibits IV-11 and IV-12 show that it has increased in importance as a problem, and that a significant proportion of managers rank the improvement of personnel productivity as a major plan for the 1981-1983 period.

  - The development of on-line systems and, presumably, related data base systems to support them, decline in importance beyond 1982.

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EXHIBIT IV-11

EDP PLANS FOR RESPONDENTS IN THE
PROCESS MANUFACTURING SECTOR
(Percent)

PLAN	ON 1981 AGENDA	RANKED FIRST 1981	ON 1982 AGENDA	RANKED FIRST 1982	ON 1983 AGENDA	RANKED FIRST 1983
Develop On-Line Systems	72.7%	15.2%	81.8%	24.2%	27.3%	9.1%
Modify On-Line Systems	27.3	12.1	39.4	15.2	27.3	21.2
Develop Data Base Systems	39.4	3.0	54.5	12.1	39.4	15.2
Modify Data Base Systems	12.1	6.1	9.1	3.0	18.2	6.1
Develop DDP Network	15.2	0	24.2	0	39.4	6.1
Modify DDP Network	21.2	3.0	18.2	6.1	24.2	9.1
Install Word Processing	24.2	3.0	12.1	3.0	12.1	3.0
Integrate Word Processing and Data Processing	18.2	3.0	30.3	6.1	39.4	6.1
Develop Long-Range EDP Plan	30.3	15.2	15.2	6.1	18.2	6.1
Revise Long-Range EDP Plan	33.3	6.1	33.3	9.1	39.4	12.1
Integrate EDP Plan with Business Plan	63.6	24.2	42.4	6.1	66.7	9.1
Improve EDP Personnel Productivity	42.4	6.1	63.6	15.2	48.5	12.1
Measure EDP Personnel Productivity	24.2	6.1	18.2	3.0	30.3	6.1
Convert Hardware System	24.2	0	27.3	0	12.1	0
Convert Operating System	27.3	0	21.2	3.0	9.1	0
Develop New Batch Applications	18.2	3.0	15.2	0	15.2	0
Integrate Batch Applications	18.2	3.0	9.1	0	18.2	3.0
Improve End-User Relations	45.5	9.1	39.4	9.1	27.3	6.1
Other	15.1	0	9.1	0	9.1	0

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EXHIBIT IV-12

EDP PROBLEMS FOR RESPONDENTS IN THE PROCESS MANUFACTURING SECTOR

(Percent)

PROBLEM	MEN-TIONED 1980	RANKED FIRST 1980	MEN-TIONED 1981	RANKED FIRST 1981	PLAN IN PLACE
Long-Range Business Objectives	18.2%	6.1%	30.3%	9.1%	12.1%
Long-Range EDP Objectives	45.5	9.1	39.4	9.1	27.3
Relations with Management	24.2	9.1	30.3	12.1	15.2
Relations with End Users	33.3	9.1	39.4	9.1	21.2
Data Center Operations	18.2	9.1	21.2	3.0	9.1
Project Planning	18.2	0	24.2	0	15.2
Project Scheduling - Estimating	21.2	3.0	15.2	3.0	12.1
Project Scheduling - Priorities	27.3	3.0	30.3	12.1	30.3
System Development Specifications	21.2	3.0	18.2	0	12.1
EDP Budget	30.3	3.0	36.4	0	36.4
Personnel Recruiting	36.4	9.1	36.4	9.1	15.2
Personnel Training	18.2	0	21.2	3.0	18.2
Personnel Retention	33.3	15.2	27.3	15.2	18.2
Personnel Productivity	39.4	6.1	48.5	21.2	24.2
Hardware Capacity (CPU)	33.3	15.2	30.3	9.1	15.2
Hardware Capacity (Disk)	12.1	0	18.2	0	15.2
Hardware Maintenance	18.2	3.0	9.1	0	3.0
System Software	24.2	0	30.3	3.0	18.2
Network Facilities	18.2	0	24.2	3.0	18.2
Other	6.0	0	6.1	0	6.0

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- Word processing systems apparently are already fairly common in this industry sector, as the installation of word processing is given relatively low importance in managers' plans. Over the next two years, integration of such systems with data processing systems is projected to rise.

- Meshing the long-range data processing plan with the firm's long-range business plan reflects increased awareness of the importance of data processing to the operations of the business.

- Nevertheless, there is a markedly higher proportion of respondents indicating problems in their relationships with upper management as compared with the discrete manufacturing sector.

4. KEY ISSUE STATUS REVIEW

- The most frequently mentioned applications development priorities are largely accounting applications.

- Operations support systems mentioned include facilities maintenance; equipment dispatching, maintenance, and control; maintenance scheduling; and shipping and receiving.

- Process manufacturing sector respondents mentioned materials requirement planning, shop floor control, inventory control, and mine production and maintenance among the manufacturing and manufacturing support systems under development.

- Major subsectors in the process manufacturing industry are extractive industries. Accordingly, natural resource management is a major concern, and applications such as materials management, map plotting, energy management, and automated land management support this activity.

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- Support of management planning functions is indicated by applications development priorities for operations cost reporting, statistical analysis, financial planning, and purchase/revenue analysis.

- Only 53% of applications development priorities in the process manufacturing sector are on-line systems. This is seven percentage points below the cross-industry average.

  - However, at 28% the sector's applications priorities designed to operate on-line at remote sites is somewhat higher than the cross-industry average of 25.5%.

  - As in the case of discrete manufacturing and distribution, the process manufacturing sector's commitment to distributed data processing is suggested by the 12% of priority applications designed to operate in batch mode at remote sites and transmit summary data to central sites.

- The percentage of process manufacturing respondents indicating the use of telecommunications today is 78.6%, with another 14.3% forecasting on-line operations within three years.

  - The average number of locations linked by telecommunications is eight and ranges from one to 60. Respondents in this industry sector plan to add an average of seven locations in 1982 and nine in 1983.

  - The range varies from a telecommunications system supporting one location to a 15-site network that is to expand by about eight times to 118 locations by the end of 1983.

- The process manufacturing sector reports a higher percentage of current usage of office automation components than the industry average.

  - Exceptions are in the areas of wideband transmission (both intrabuilding and intracity).

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- IS management responsibility for these components, however, is markedly below the industry average.

- Looking out five years, IS management responsibility for these components is also forecast to remain below the industry average.

D. TRANSPORTATION AND UTILITIES

1. INDUSTRY SECTOR OVERVIEW

- This industry sector comprises those firms identified by SIC codes 40 through 49, and includes public land, sea, and air transportation, transportation services, the United States Postal Service, pipeline companies, and communication, electric, gas, and sanitary services.

- Industries within this sector are characterized by:

  - The provision of carrier services to the public.

  - Extensive regulatory control at the federal, state, and local level.

- This sector accounts for 8.9% of the U.S. gross national product and employs 4.8% of the U.S. labor force, but accounts for only 3.2% of domestic spending for EDP. The bulk of this is spent by airlines and the communications utilities.

- Until very recently, government regulation imposed limits on the level of profitability that most firms within this sector were permitted to achieve. This was particularly true of communication, electric, and gas companies.

  - Thus, the incentive to automate had been provided by the desire to maximize profitability within the limits prescribed by regulation.

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- In some cases, where monopolies were sanctioned by regulation, investment in data processing equipment afforded an opportunity to keep earnings within the limits permitted.

- Recent steps taken to deregulate industries within this sector appear likely to induce participants to turn increasingly to automation as an option to reduce the labor intensity in selected industries.

- Exhibit IV-13 shows a profile summary of firms within this sector in two size categories.

2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit IV-14 shows that EDP budgets as a percentage of sales largely tend to fall below 1% among respondents to this year's survey.

- In 1981, only 28% of respondents reported budget changes amounting to less than a 10% increase. For 1982, this percentage declines further to 21%, as shown in Exhibit IV-15, while increases in the 10%-30% range are projected by 71% of the respondents.

- As shown in Exhibit IV-16, largest spending increases within this industry sector are forecast to occur in the areas of disaster planning, other software, network expense, and EDP training.

  - Because of their small representation in total EDP budgets, the increases projected for disaster planning and EDP training are not considered as significant as those for the other categories.

3. MAJOR PLANS AND PROBLEMS

- As in the other industry sectors, the development of on-line and data base systems have the highest priorities in IS managers' plans, as shown in Exhibit IV-17.

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EXHIBIT IV-13

RESPONDENT PROFILE - TRANSPORTATION AND UTILITIES SECTOR

PROFILE CHARACTERISTIC	SURVEY AVERAGES BY COMPANY SIZE IN SALES	
	$249 MILLION OR LESS	$250 MILLION OR MORE
Annual Sales ($ millions)	$ 170	$ 2,139
Total Employees	1,570	28,048
EDP Employees	33	729
EDP Employees as Percent of Total	2.1%	2.6%
EDP Budget ($ Thousands)	$ 1,128	$42,642
EDP Budget as Percent of Annual Sales	0.7%	2.0%
EDP Budget Per EDP Employee	$33,185	$55,755
EDP Budget Per Employee	$ 718	$ 1,298

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EXHIBIT IV-14

RATIO OF EDP BUDGET TO COMPANY SALES:
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE
TRANSPORTATION AND UTILITIES SECTOR

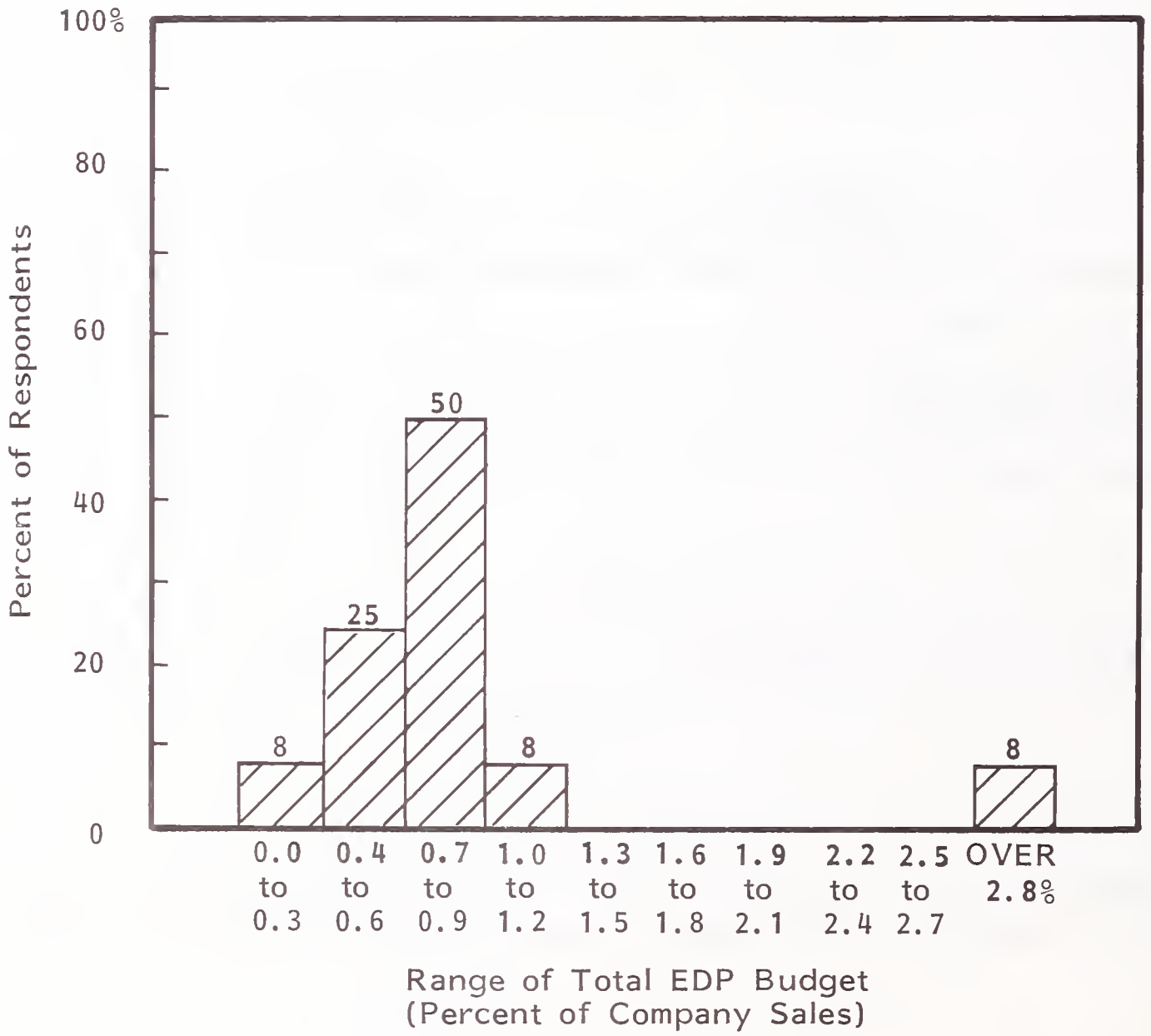

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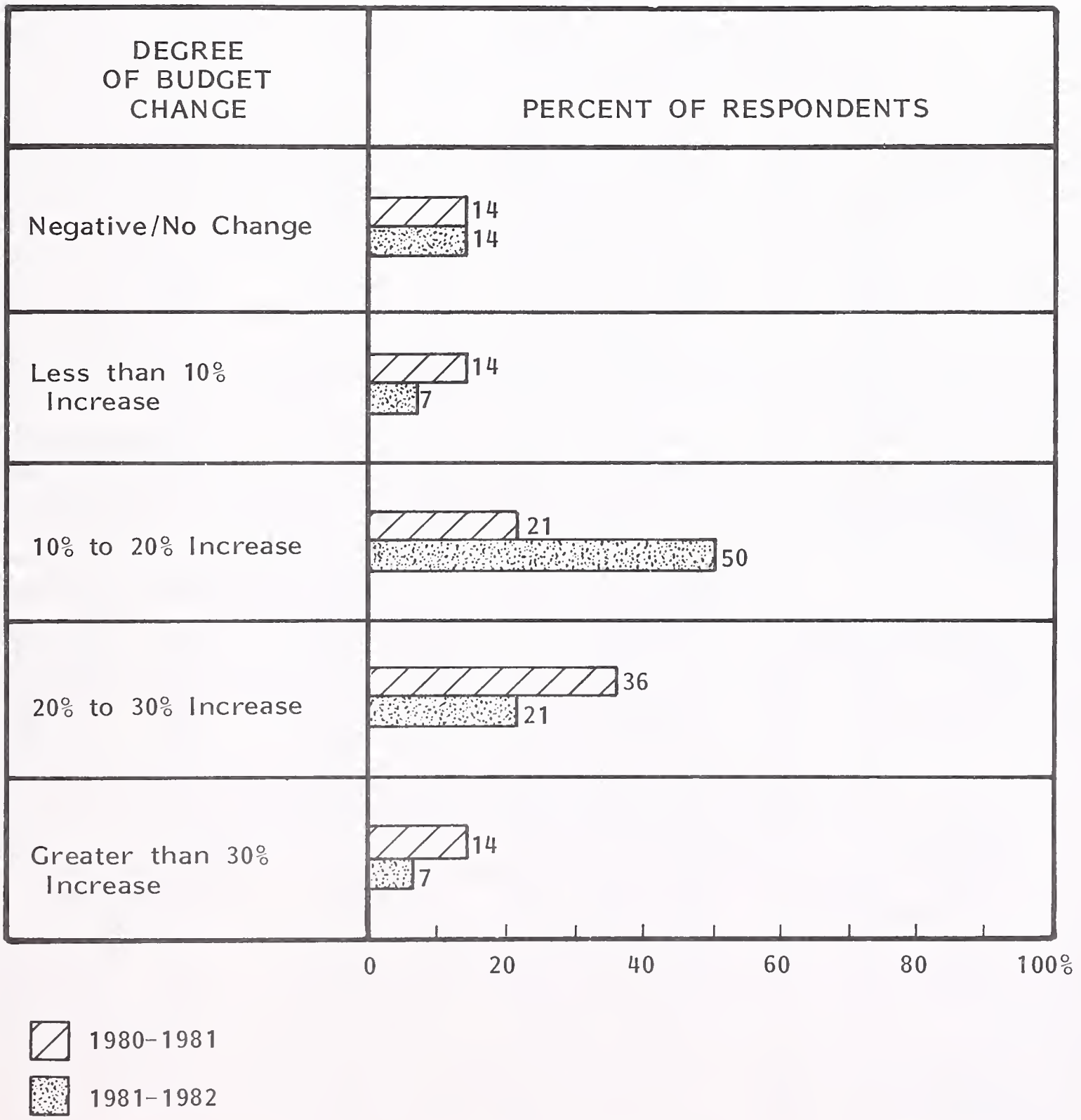
EXHIBIT IV-15

ACTUAL AND PLANNED EDP BUDGET
GROWTH FOR RESPONDENTS IN THE
TRANSPORTATION AND UTILITIES SECTOR



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EXHIIBT IV-16

BREAKDOWN OF INFORMATION SYSTEMS BUDGET IN THE TRANSPORTATION AND UTILITIES SECTOR

BUDGET CATEGORY	AMOUNT ($ Thousands)	REPORTED		1982 FORECAST ($ Thousands)	PERCENT CHANGE
		PERCENT OF BUDGET	PERCENT REPORTING*		
Salaries	$18,558	51.9%	78.6%	$21,633	+16.6%
EDP Training	56	0.2	64.3	68	+21.4
Non-EDP Training	47	0.5	21.4	51	+ 8.5
Central Site Mainframes	868	15.4	71.4	930	+ 7.1
Central Site Peripherals	495	7.7	50.0	513	+ 3.6
Remote Site Mainframes	24	0.5	14.3	24	0
Remote Site Peripherals	22	0.8	7.1	22	0
Minicomputers	71	2.7	21.4	44	-38.0
Microcomputers/Personal Computers	3	0	7.1	3	0
Terminals	2,211	11.5	64.3	2,431	+10.0
Communications Hardware and Software	208	2.3	35.7	226	+ 8.7
Network Expense	435	2.4	42.9	538	+23.7
Other Software	1,025	2.8	64.3	1,275	+24.4
Vendor Maintenance	12,909	8.2	57.1	14,441	+11.9
Third-Party Maintenance	175	0.7	14.3	190	+ 8.6
Outside Services	1,734	2.3	28.6	1,802	+ 3.9
Data Security	23	0.3	21.4	25	+ 8.7
Disaster Planning	28	0.2	14.3	36	+28.6
Supplies	6,250	11.0	78.6	7,040	+12.6

* 21% OF RESPONDENTS DECLINED TO PROVIDE BUDGET LINE ITEM DETAILS.

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EXHIBIT IV-17

EDP PLANS FOR RESPONDENTS IN THE TRANSPORTATION AND UTILITIES SECTOR

(Percent)

PLAN	ON 1981 AGENDA	RANKED FIRST 1981	ON 1982 AGENDA	RANKED FIRST 1982	ON 1983 AGENDA	RANKED FIRST 1983
Develop On-Line Systems	92.9%	42.9%	50.0%	21.4%	57.1%	21.4%
Modify On-Line Systems	35.7	0	42.9	0	7.1	0
Develop Data Base Systems	21.4	7.1	42.9	14.3	35.7	14.3
Modify Data Base Systems	28.6	0	7.1	0	14.3	0
Develop DDP Network	7.1	0	7.1	0	7.1	0
Modify DDP Network	7.1	0	14.3	0	28.6	7.1
Install Word Processing	0	0	7.1	0	0	0
Integrate Word Processing and Data Processing	0	0	21.4	0	28.6	0
Develop Long-Range EDP Plan	0	0	7.1	0	21.4	0
Revise Long-Range EDP Plan	28.6	0	35.7	7.1	35.7	0
Integrate EDP Plan with Business Plan	35.7	0	28.6	0	42.9	0
Improve EDP Personnel Productivity	50.0	7.1	28.6	7.1	35.7	0
Measure EDP Personnel Productivity	14.3	0	21.4	7.1	21.4	7.1
Convert Hardware System	35.7	0	35.7	21.4	0	0
Convert Operating System	21.4	7.1	7.1	0	0	0
Develop New Batch Applications	21.4	7.1	7.1	0	0	0
Integrate Batch Applications	0	0	21.4	0	21.4	14.3
Improve End-User Relations	42.9	21.4	28.6	7.1	28.6	7.1
Other	7.1	0	7.1	0	0	0

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- The integration of word processing and data processing will increase in importance over the next two years.

- Next year, operating system conversion will temporarily take precedence over improving IS personnel productivity, which nevertheless remains a major management concern.

- IS managers in this sector rank the revision of the long-range IS plan well above the development of such a plan, which correlates well with the maturity of data processing in this industry sector, and the fact that many organizations in this sector have had a long-range IS plan in existence for some time.

- Project planning, relations with management and end users, and personnel productivity are among the most frequently mentioned problems shown in Exhibit IV-18. Management relations and personnel recruiting, however, are highest ranked for 1981.

4. KEY ISSUE STATUS REVIEW

- Applications priorities cited by this industry sector tend largely to be industry specific.

- Telecommunications systems are reported by 71.4% of industry sector respondents, and another 14.2% anticipate going on-line within the next three years.

  - An average of 16 locations are linked by telecommunications, with another 15 to be added in 1982 and 16 in 1983.

  - The average number of terminals supported per system is 3,862 on a full-time basis and 115 on an occasional basis.

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EXHIBIT IV-18

EDP PROBLEMS FOR RESPONDENTS IN THE TRANSPORTATION AND UTILITIES SECTOR

(Percent)

PROBLEM	MEN-TIONED 1980	RANKED FIRST 1980	MEN-TIONED 1981	RANKED FIRST 1981	PLAN IN PLACE
Long-Range Business Objectives	14.3%	0	14.3%	0	14.3%
Long-Range EDP Objectives	21.4	14.3	28.6	7.1	42.9
Relations with Management	7.1	0	35.7	21.4	14.3
Relations with End Users	35.7	21.4	35.7	0	21.4
Data Center Operations	7.1	0	7.1	7.1	14.3
Project Planning	28.6	7.1	42.9	0	28.6
Project Scheduling - Estimating	14.3	0	14.3	0	14.3
Project Scheduling - Priorities	21.4	0	21.4	7.1	7.1
System Development Specifications	0	0	28.6	0	21.4
EDP Budget	14.3	0	28.6	7.1	28.6
Personnel Recruiting	28.6	0	28.6	14.3	21.4
Personnel Training	7.1	0	7.1	0	21.4
Personnel Retention	14.3	7.1	14.3	7.1	14.3
Personnel Productivity	28.6	7.1	42.9	7.1	28.6
Hardware Capacity (CPU)	42.9	0	35.7	7.1	57.1
Hardware Capacity (Disk)	35.7	7.1	14.3	0	28.6
Hardware Maintenance	14.3	7.1	14.3	0	42.9
System Software	0	0	21.4	0	21.4
Network Facilities	7.1	0	0	0	0
Other	0	0	7.1	7.1	0

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- As the firms in this industry sector are largely domestic in their geographic scope of operations, it is to be expected that network support for overseas communications is not a serious concern.

  - With the exception of intracompany electronic mail, the sector's use of, and management responsibility for, office automation components is well below the cross-industry average.

  - Historically, the airlines' use of an industry network pool (ARINC), and the dependence of communication utilities on networks for the production of revenues, may have a great deal to do with the fact that EDP management responsibility for telecommunications components is virtually nonexistent.

E. BANKING AND FINANCE

1. INDUSTRY SECTOR OVERVIEW

- This industry sector comprises SIC categories 60, 61, 62, and 67, and includes:

  - Commercial banks.

  - Savings and loan associations ("thrifts").

  - Credit unions.

  - Finance companies.

  - Securities and commodity brokerage firms.

  - Mortgage bankers.

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- Approximately 90% of this industry sector is composed of banking firms.

- The banking and finance sector accounts for 1.5% of total nonfarm civilian employment and 5.3% of domestic spending for data processing. INPUT estimates that this sector will spend $5.3 billion for data processing in 1981.

- Overall, the industry has a very conservative operating philosophy and for many years was unlikely to be innovative in its use of data processing, except for the very largest firms.

  - Technology is being used more now to respond to competitive pressures and the high cost of money which makes it desirable to offer fee-based products.

    . This is best typified by the injection of demand deposit accounting into the savings and loan subsector, and automated retail banking services provided by automated teller machines.

  - In the securities industry, the concept of long-range strategic planning seems to be the exception rather than the rule, as planning cycles seldom extend beyond the end of a fiscal year.

- Compensation practices within the financial industry tend to favor the short-term targets at the expense of long-term support operations.

  - Therefore, the turnover of skilled competent personnel is likely to be higher than the national average, while recruitment of replacement personnel is a serious management problem.

- Exhibit IV-19 shows a profile summary of firms within this sector in two size categories.

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EXHIBIT IV-19

RESPONDENT PROFILE - BANKING AND BROKERAGE SECTOR

PROFILE CHARACTERISTIC	SURVEY AVERAGES BY COMPANY SIZE IN ASSETS	
	$249 MILLION OR LESS	$250 MILLION OR MORE
Assets ($ millions)	$ 169	$ 1,715
Total Employees	251	7,896
EDP Employees	24	164
EDP Employees as Percent of Total	9.6%	2.1%
EDP Budget ($ Thousands)	$ 733	$ 4,705
EDP Budget as Percent of Assets	0.4%	0.3%
EDP Budget Per EDP Employee	$30,988	$43,874
EDP Budget Per Employee	$ 3,608	$ 3,928

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2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit IV-20 shows that the distribution of EDP budgets in the banking and brokerage sector is little changed from last year, being concentrated largely in the zero to 0.3% range as a percentage of assets.

  - Budget increases in the financial sector are projected, as last year, to occur largely in the 10-20% range, as shown in Exhibit IV-21.

- Exhibit IV-22 presents a breakdown of budget items for the financial sector. Salaries are somewhat below the overall average at 42.9% of the total.

  - The high proportion expended for communications hardware and software (4.5%) and terminals (6.8%), reflects spending for automated teller machines and teller terminals largely as a result of competitive pressures.

  - Together with the insurance sector, the banking sector spends proportionately twice as much as most other industries on vendor maintenance, reflecting a much more pronounced tendency to purchase computing equipment. This is probably due to banks' limited opportunities to avail themselves of investment tax credits as compared to manufacturing firms, so that computing equipment represents a major opportunity for investment in equipment.

  - At 2.1% of the budget, banks' spending for disaster planning is proportionately at least twice as much as in any other industry sector.

  - This is one of the few industry sectors projecting large percentage decreases in a number of budget categories for 1982.

3. MAJOR PLANS AND PROBLEMS

- Exhibits IV-23 and IV-24 present a summary of plans and problems in this industry sector.

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EXHIBIT IV-20

RATIO OF EDP BUDGET TO COMPANY ASSETS:
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE
BANKING AND BROKERAGE SECTOR

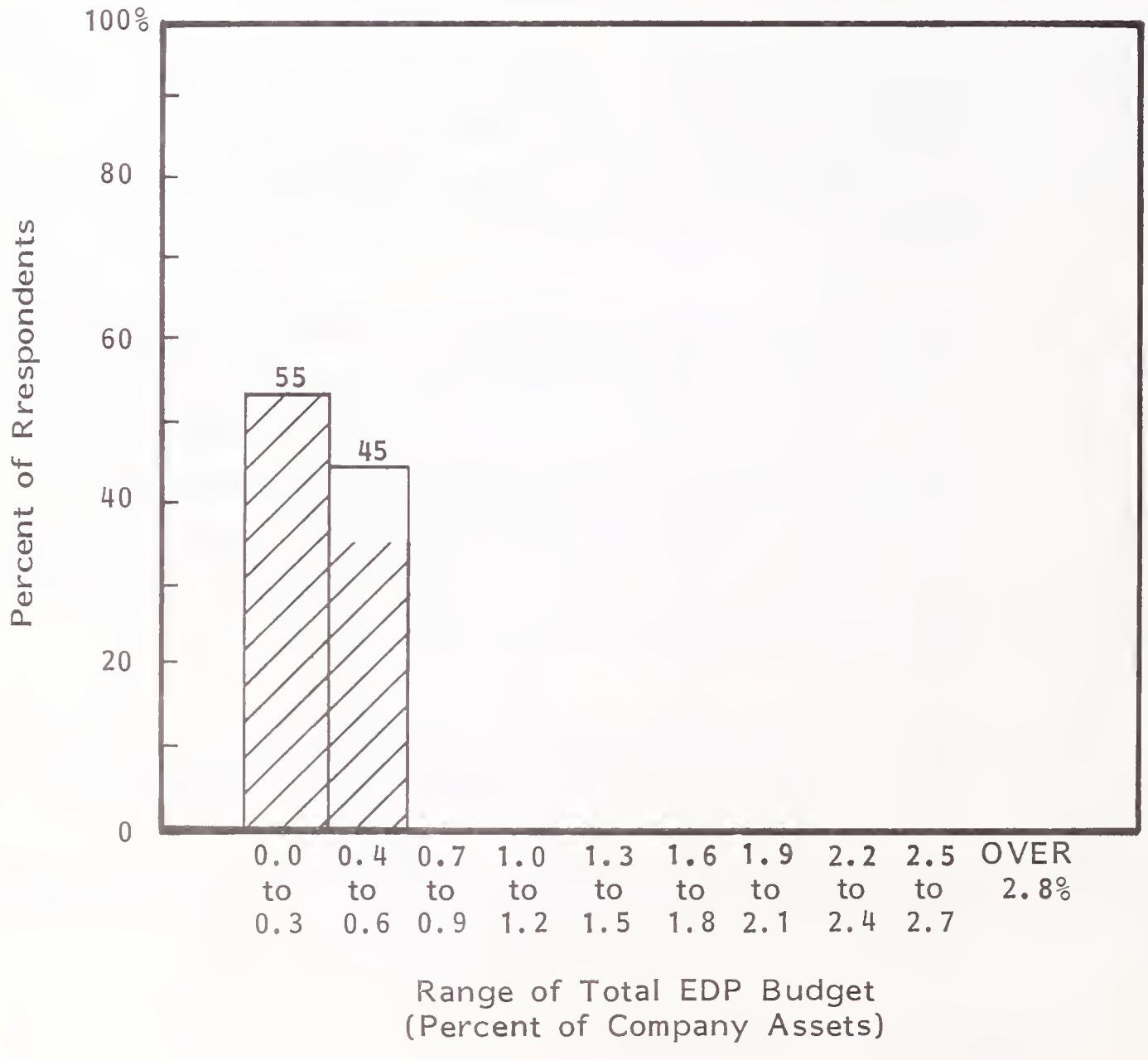

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EXHIBIT IV-21

ACTUAL AND PLANNED EDP BUDGET GROWTH FOR RESPONDENTS IN THE BANKING AND BROKERAGE SECTOR

DEGREE OF BUDGET CHANGE	PERCENT OF RESPONDENTS
Negative/No Change	11 / 8
Less than 10% Increase	11 / 8
10% to 20% Increase	67 / 73
20% to 30% Increase	11 / 0
Greater than 30% Increase	

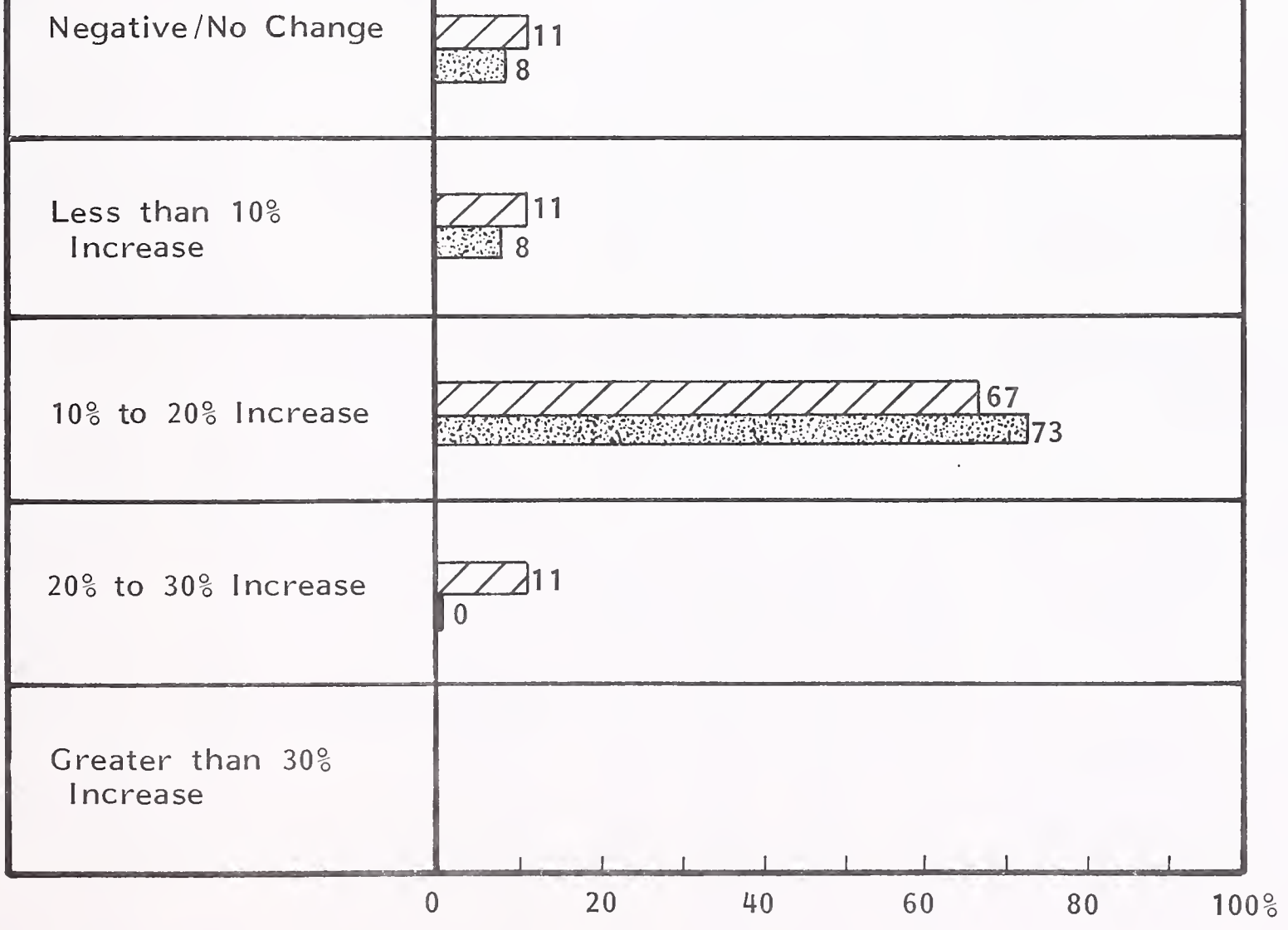

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EXHIBIT IV-22

BREAKDOWN OF INFORMATION SYSTEMS BUDGET IN THE BANKING AND BROKERAGE SECTOR

BUDGET CATEGORY	AMOUNT ($ Thousands)	REPORTED		1982 FORECAST ($ Thousands)	PERCENT CHANGE
		PERCENT OF BUDGET	PERCENT REPORTING*		
Salaries	$736	42.9%	61.5%	$794	+ 7.9%
EDP Training	17	1.1	61.5	18	+ 5.9
Non-EDP Training	5	0.5	7.7	5	0
Central Site Mainframes	606	15.6	61.5	601	- 0.8
Central Site Peripherals	602	12.0	53.8	618	+ 2.7
Remote Site Mainframes	360	4.8	7.7	90	-75.0
Remote Site Peripherals	285	4.6	16.7	75	-73.7
Minicomputers	280	4.1	30.8	280	0
Minicomputers/Personal Computers	0	0	0	0	0
Terminals	462	6.8	46.2	450	- 2.6
Communications Hardware and Software	501	4.5	53.8	505	+ 0.8
Network Expense	323	4.0	61.5	333	+ 3.1
Other Software	213	3.3	38.5	219	+ 2.8
Vendor Maintenance	215	9.1	69.2	207	- 3.7
Third-Party Maintenance	78	1.0	8.3	62	-20.5
Outside Services	0	0	0	0	0
Data Security	16	0.2	8.3	20	+25.0
Disaster Planning	25	2.1	16.7	14	-44.0
Supplies	268	11.2	58.3	222	-17.2

*38% OF RESPONDENTS DECLINED TO FURNISH BUDGET LINE ITEM DETAILS.

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EXHIBIT IV-23

EDP PLANS FOR RESPONDENTS IN THE BANKING AND BROKERAGE SECTOR

(Percent)

PLAN	ON 1981 AGENDA	RANKED FIRST 1981	ON 1982 AGENDA	RANKED FIRST 1982	ON 1983 AGENDA	RANKED FIRST 1983
Develop On-Line Systems	46.2%	15.4%	38.5%	15.4%	38.5%	23.1%
Modify On-Line Systems	23.1	0	30.8	7.7	30.8	0
Develop Data Base Systems	15.4	15.4	38.5	15.4	53.8	38.5
Modify Data Base Systems	15.4	0	23.1	0	30.8	0
Develop DDP Network	23.1	7.7	15.4	7.7	23.1	7.7
Modify DDP Network	23.1	7.7	7.7	0	15.4	0
Install Word Processing	23.1	7.7	15.4	7.7	15.4	15.4
Integrate Word Processing and Data Processing	7.7	0	15.4	0	30.8	0
Develop Long-Range EDP Plan	61.5	0	76.9	15.4	23.1	0
Revise Long-Range EDP Plan	7.7	0	23.1	0	30.8	7.7
Integrate EDP Plan with Business Plan	38.5	0	38.5	0	30.8	0
Improve EDP Personnel Productivity	53.8	7.7	53.8	15.4	23.1	0
Measure EDP Personnel Productivity	15.4	0	30.8	15.4	30.8	0
Convert Hardware System	15.4	0	15.4	0	7.7	0
Convert Operating System	30.8	7.7	0	0	23.1	7.7
Develop New Batch Applications	30.8	0	30.8	0	23.1	7.7
Integrate Batch Applications	7.7	0	15.4	0	15.4	0
Improve End-User Relations	61.5	15.4	30.8	0	30.8	0
Other	30.8	7.7	7.7	0	15.4	7.7

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EXHIBIT IV-24

EDP PROBLEMS FOR RESPONDENTS IN THE BANKING AND BROKERAGE SECTOR

(Percent)

PROBLEM	MEN-TIONED 1980	RANKED FIRST 1980	MEN-TIONED 1981	RANKED FIRST 1981	PLAN IN PLACE
Long-Range Business Objectives	7.7%	0	23.1%	7.7%	0
Long-Range EDP Objectives	38.5	0	61.5	15.4	15.4%
Relations with Management	15.4	0	38.5	7.7	7.7
Relations with End Users	30.8	7.7%	53.8	15.4	23.1
Data Center Operations	15.4	0	23.1	7.7	0
Project Planning	15.4	0	23.1	7.7	15.4
Project Scheduling - Estimating	0	0	7.7	0	0
Project Scheduling - Priorities	7.7	7.7	15.4	0	0
System Development Specifications	7.7	0	15.4	0	0
EDP Budget	7.7	0	15.4	7.7	15.4
Personnel Recruiting	30.8	7.7	38.5	7.7	15.4
Personnel Training	15.4	0	46.2	7.7	23.1
Personnel Retention	30.8	15.4	46.2	15.4	15.4
Personnel Productivity	7.7	0	23.1	7.7	7.7
Hardware Capacity (CPU)	30.8	0	38.5	7.7	23.1
Hardware Capacity (Disk)	7.7	0	23.1	7.7	30.8
Hardware Maintenance	7.7	0	15.4	7.7	7.7
System Software	15.4	7.7	30.8	7.7	15.4
Network Facilities	23.1	7.7	15.4	7.7	15.4
Other	23.1	15.4	23.1	7.7	7.7

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- On-line system development, as in every other sector, is one of the most important priorities, while the development of data base systems will also increase in importance over the next two years.

- As a concern, long-range planning has risen in importance from 1980 but is expected to peak in 1982.

- Personnel problems are reported to be more pronounced in the financial sector than in most other sectors. Retention of qualified personnel is one of the top-ranked problems for both 1980 and 1981 for this sector.

- Conclusions that can be drawn from the data suggest that:

  - With one of the lowest average budgets per EDP employee, and with the proportion spent on salaries being fairly close to the norm, the personnel retention problem is probably heavily influenced by salary considerations.

4. KEY ISSUE STATUS REVIEW

- The high frequency of mentions of Negotiable Order of Withdrawal (NOW) account processing as an applications development priority reflects the increasing number of thrifts that are providing demand deposit services to their customers.

- Similarly, automated teller machine (ATM) systems implementation reflects the trend among commercial banks to provide automated 24-hour retail banking services in response to competition.

- Although 94% of respondents classify their systems as telecommunications systems, with the balance expecting to go on-line by 1984, only 56% explicitly report support of more than one location, reflecting limited branch banking regulations in many states.

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- Moreover, only 7.4% of new applications support remote sites on-line (as compared with 25.5% for all industries), and only 1.9% involve the transmission of summary data from remote sites to central sites.

- The banking and financial sector indicates that 56% of priority applications are intended to operate on-line, almost six percentage points below the cross-industry average.

  - Priority applications obviously intended to operate on-line are ATM support, on-line deposits, remote printing, remote job entry, and on-line proof sytems.

  - On-line operation appears highly likely as well for customer information systems, money transfer, foreign exchange, portfolio analysis, and bond trading systems.

- With the exception of communicating word processors, computerized PBXs and intracompany electronic mail, the banking sector shows virtually no involvement with office automation through 1983.

F. INSURANCE

1. INDUSTRY SECTOR OVERVIEW

- In the United States, the insurance sector comprises three broad categories: life insurance, accident and health insurance, and property and liability insurance.

- The sector employs about 1.9 million people, or 1.8% of the non-agricultural workforce, and has responsibility for assets which INPUT estimates totaled more than $690 billion at the end of 1980.

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- EDP spending by this sector of an estimated $6.1 billion in 1981 represents 12.2% of domestic expenditures by EDP departments. This is exceeded only by the discrete and process manufacturing subsectors.

- Data processing is increasingly important to the insurance sector to both reduce costs and increase service.

  - On-line systems are increasingly important, especially those which unite agents and companies.

    . Systems to help independent agents and "American Agency" property and casualty (P&C) companies compete more effectively, with direct writers are being rapidly introduced.

- Vigorous competition is a factor which is encouraging computer-based projects to determine product line profitability and to plan new products.

- In the nonlife subsectors of the industry, the servicing of insured and insurable risks is increasingly dependent upon regional experience.

  - In the nonlife subsector, regional operations by larger companies increasingly involve a distributed processing scheme.

- Exhibit IV-25 shows the respondent profile characteristics for two size categories. A comparison of these two categories with counterparts in other industries reveals a somewhat different set of ratios. Reasons for these differences relate to the business requirements of the industry.

2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit IV-26 shows the distribution of EDP budgets in the insurance sector relative to sales, defined as revenue from premiums.

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EXHIBIT IV-25

RESPONDENT PROFILE -
INSURANCE SECTOR

PROFILE CHARACTERISTIC	SURVEY AVERAGES BY COMPANY SIZE IN SALES	
	$249 MILLION OR LESS	$250 MILLION OR MORE
Annual Sales (Premiums) ($ millions)	$ 75	$ 917
Total Employees	317	1,808
EDP Employees	27	206
EDP Employees as Percent of Total	8.5%	11.4%
EDP Budget ($ Thousands)	$ 1,110	$ 4,610
EDP Budget as Percent of Annual Sales	1.9%	1.3%
EDP Budget Per EDP Employee	$51,690	$34,908
EDP Budget Per Employee	$ 3,366	$ 3,977

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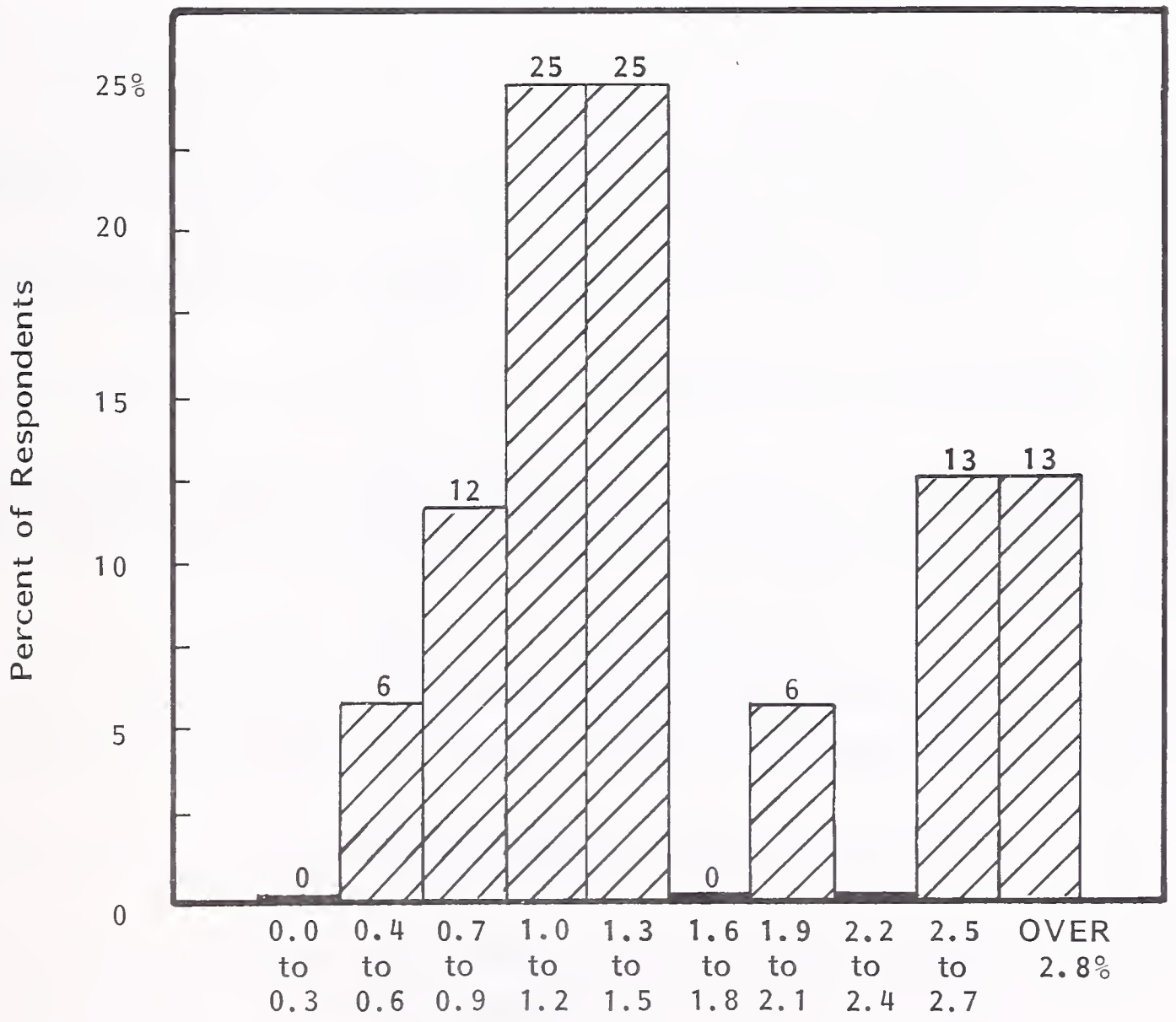
EXHIBIT IV-26

RATIO OF EDP BUDGET TO COMPANY SALES (PREMIUMS):
DISTRIBUTION OF RATIOS AMONG RESPONDENTS
IN THE INSURANCE SECTOR



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- EDP budgets in the insurance sector rose 16.5% in 1981, and a 12.6% increase is projected for 1982.

- Exhibit IV-27 shows that almost 75% of respondents increased EDP spending by more than 10% in 1981, and that a like number project an increase of more than 10% in 1982.

- The details of insurance information systems budgets are shown in Exhibit IV-28.

  - At 13.4% of the budget, expenditures for supplies are the highest for all industry sectors. Insurance systems, like utility industry systems, remain largely tied to the use of turnaround documents (leading life insurance companies average 40,000 premium billings per day), and this probably contributes to the higher than average spending on supplies.

3. MAJOR PLANS AND PROBLEMS

- Examination of the data in Exhibits IV-29 and IV-30 shows that the insurance industry has a much more mature EDP operation than most other industry sectors.

  - Integration of the business plan with the IS plan appears to be the overriding concern, but this is expected to peak this year or next.

  - Personnel productivity is a continuing concern.

  - Hardware capacity problems appear to have increased in 1981, but the relatively low priorities assigned to system conversion over the next few years suggest that the problem relates to increased transaction volume, not new system development.

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EXHIBIT IV-27

ACTUAL AND PLANNED EDP BUDGET
GROWTH FOR RESPONDENTS
IN THE INSURANCE SECTOR

DEGREE OF BUDGET CHANGE	PERCENT OF RESPONDENTS
Negative/No Change	5 / 9
Less than 10% Increase	21 / 18
10% to 20% Increase	37 / 50
20% to 30% Increase	16 / 23
Greater than 30% Increase	21 / 0

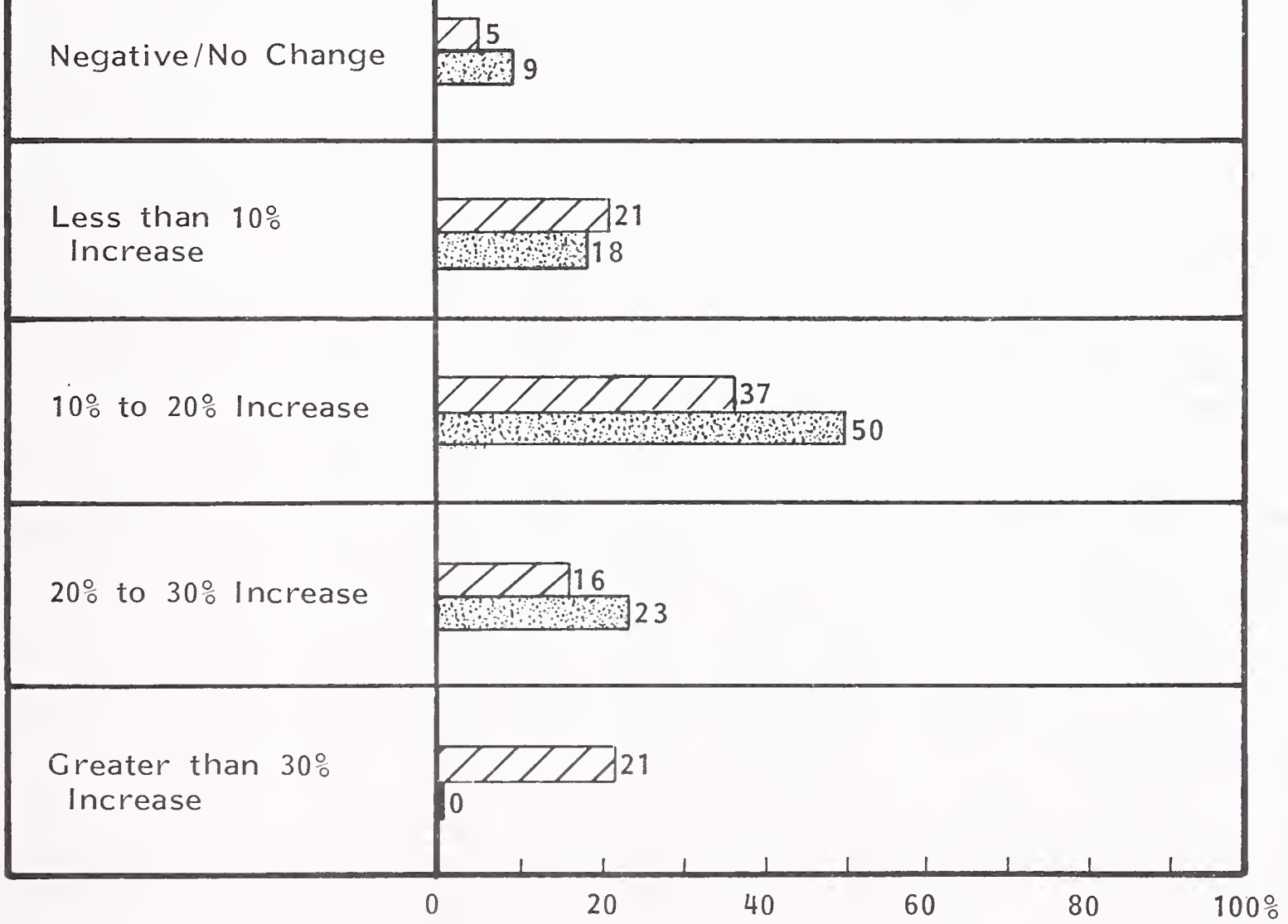

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EXHIBIT IV-28

BREAKDOWN OF INFORMATION SYSTEMS BUDGET IN THE INSURANCE SECTOR

BUDGET CATEGORY	AMOUNT ($ Thousands)	REPORTED		1982 FORECAST ($ Thousands)	PERCENT CHANGE
		PERCENT OF BUDGET	PERCENT REPORTING*		
Salaries	$1,452	49.0%	76.9%	$1,618	+11.0%
EDP Training	33	1.2	53.8	34	+ 3.0
Non-EDP Training	10	0.5	5.5	15	+50.0
Central Site Mainframes	452	14.7	69.2	503	+11.3
Central Site Peripherals	324	12.8	61.5	362	+11.7
Remote Site Mainframes	202	10.6	11.1	202	0
Remote Site Peripherals	53	3.7	15.4	53	0
Minicomputers	68	9	15.4	70	+ 2.9
Microcomputers/Personal Computers	0	0	0	0	0
Terminals	129	5.3	66.7	143	+10.8
Communications Hardware and Software	58	2.2	55.6	67	+15.5
Network Expense	33	1.3	30.8	38	+15.1
Other Software	101	3.0	53.8	107	+ 5.9
Vendor Maintenance	136	5.8	53.8	148	+ 8.8
Third-Party Maintenance	29	6.5	7.7	31	+ 6.8
Outside Services	79	3.0	38.5	62	-21.5
Data Security	16	9	15.4	16	0
Disaster Planning	33	0.6	7.7	33	0
Supplies	427	13.4	61.5	467	+ 9.3

* 23% OF RESPONDENTS DECLINED TO FURNISH BUDGET LINE ITEM DETAILS.

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EXHIBIT IV-29

EDP PLANS FOR RESPONDENTS IN THE INSURANCE SECTOR

(Percent)

PLAN	ON 1981 AGENDA	RANKED FIRST 1981	ON 1982 AGENDA	RANKED FIRST 1982	ON 1983 AGENDA	RANKED FIRST 1983
Develop On-Line Systems	76.9%	7.7%	46.2%	0	7.7%	0
Modify On-Line Systems	38.5	15.4	15.4	0	38.5	7.7%
Develop Data Base Systems	38.5	15.4	38.5	15.4%	30.8	7.7
Modify Data Base Systems	7.7	0	7.7	0	15.4	0
Develop DDP Network	15.4	15.4	15.4	7.7	15.4	7.7
Modify DDP Network	7.7	0	7.7	0	15.4	0
Install Word Processing	15.4	0	23.1	0	30.8	0
Integrate Word Processing and Data Processing	23.1	0	23.1	0	38.5	0
Develop Long-Range EDP Plan	15.4	0	15.4	0	7.7	0
Revise Long-Range EDP Plan	30.8	7.7	53.8	23.1	30.8	15.4
Integrate EDP Plan with Business Plan	30.8	7.7	46.2	23.1	30.8	15.4
Improve EDP Personnel Productivity	69.2	15.4	53.8	23.1	53.8	23.1
Measure EDP Personnel Productivity	23.1	0	15.4	0	23.1	7.7
Convert Hardware System	7.7	0	7.7	7.7	7.7	0
Convert Operating System	0	0	7.7	0	7.7	0
Develop New Batch Applications	7.7	0	15.4	0	23.1	0
Integrate Batch Applications	7.7	0	7.7	0	7.7	0
Improve End-User Relations	38.5	0	30.8	0	23.1	0
Other	15.4	7.7	15.4	0	0	0

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EXHIBIT IV-30

EDP PROBLEMS FOR RESPONDENTS IN THE INSURANCE SECTOR

(Percent)

PROBLEM	MEN-TIONED 1980	RANKED FIRST 1980	MEN-TIONED 1981	RANKED FIRST 1981	PLAN IN PLACE
Long-Range Business Objectives	46.2%	30.8%	61.5%	46.2%	15.4%
Long-Range EDP Objectives	46.2	7.7	46.2	0	23.1
Relations with Management	46.2	7.7	30.8	7.7	23.1
Relations with End Users	38.5	15.4	38.5	0	23.1
Data Center Operations	15.4	7.7	23.1	0	15.4
Project Planning	23.1	0	30.8	15.4	7.7
Project Scheduling - Estimating	7.7	0	15.4	0	7.7
Project Scheduling - Priorities	15.4	0	23.1	0	23.1
System Development Specifications	23.1	0	15.4	0	7.7
EDP Budget	7.7	0	15.4	0	7.7
Personnel Recruiting	23.1	15.4	15.4	7.7	7.7
Personnel Training	15.4	0	15.4	0	0
Personnel Retention	15.4	0	7.7	0	0
Personnel Productivity	7.7	0	23.1	0	7.7
Hardware Capacity (CPU)	7.7	0	23.1	0	15.4
Hardware Capacity (Disk)	7.7	0	15.4	0	7.7
Hardware Maintenance	7.7	0	7.7	0	0
System Software	15.4	0	7.7	0	0
Network Facilities	15.4	0	15.4	0	7.7
Other	7.7	0	15.4	15.4	7.7

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4. KEY ISSUE STATUS REVIEW

- Insurance sector respondents indicate that the most common applications development priorities for 1981 are overwhelmingly industry specific.

- Half of industry respondents are developing policy management applications.

  - In virtually all cases, these represent implementations of on-line versions of policy management systems.

- The preeminence of agency support systems as a priority reflects the industry-wide concern with enhancing competitive pressure.

  - As in the case of virtually all other industry specific insurance applications, on-line operation is intended for these applications.

- Overall, 69.2% of priority applications are on-line at the central site and 19.2% are supported in on-line mode at remote sites.

  - The proportion of central site on-line support is a close second to the discrete manufacturing sector's percentage of 70.2% and is eight percentage points greater than the cross-industry average.

  - Only about one in five priority applications, however, is expected to operate on-line from remote sites. This compares with a one-in-four average for all sectors.

- The proportion of priority applications that the industry expects to purchase is 26.9%, or 6.1 percentage points below the cross-industry average.

- Use of electronic mail and communicating word processors is equal to the cross-industry averages.

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- Current and near-term future use of intrabuilding and intracity wideband, computerized PBXs and automatic network management systems is generally above the cross-industry average, and so is EDP management responsibility for these features.

- Videoconferencing, subminute facsimile, satellite earth stations, worldwide data communications, and private packet transmission are only beginning to be used by respondents in this sector, and only in the larger companies.

G. WHOLESALE AND RETAIL DISTRIBUTION

1. INDUSTRY SECTOR OVERVIEW

- This industry sector includes both the wholesale and retail trade and allied stores, as defined by SIC codes 50 through 59.

- The distribution sector employs 20.4 million people, or 19.1% of the U.S. nonfarm labor force. INPUT estimates that distribution will spend $5 billion on data processing in 1981, or 9.9% of the U.S. total.

- Pretax margins in this industry sector are narrower than for American industry as a whole, and computer-based systems offer the potential for margin improvement or, at the very least, for stemming margin erosion.

- Evidence that this industry sector is turning increasingly to computer-based systems, at least among the larger participants, appears in the results of this year's survey.

- More than in any other industry sector, there is a pronounced trend toward distributed systems in this sector.

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- Our sample, which is skewed toward the larger firms in the industry, represents 6.7% of total responses.

- Exhibit IV-31 is a descriptive profile of respondents in the distribution sector.

2. BUDGET AND EXPENDITURE ANALYSIS

- EDP budgets in the distribution sector rose 12.5% in 1981, and are forecast to increase 13.4% in 1982.

- The EDP budget as a percentage of sales ranges fairly evenly across the zero to 1.5% range in 1981, as shown in Exhibit IV-32.

- Exhibit IV-33 shows that two-thirds of the respondents plan budget increases of 10% or more in 1982, compared with not quite three-fifths in 1981.

- Of all the industry sectors, the distribution sector shows the highest budget proportions for remote computing equipment, suggesting a greater degree of centralization of budget responsibility than in other industries.

  - The 12% to 16% spending increases planned in 1982 for remote site equipment, communication hardware and software, and terminals (as shown in Exhibit IV-34), as well as the strong planning emphasis on the development of on-line systems, reflect a major thrust in the development of point-of-sale systems that is currently underway.

  - In the distribution sector more than in any other industry sector, the insertion of high technology in the form of on-line systems can have the most dramatic and most immediate beneficial impact upon operating margins, which probably explains the pressure to develop on-line systems.

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EXHIBIT IV-31

RESPONDENT PROFILE - DISTRIBUTION SECTOR

PROFILE CHARACTERISTIC	SURVEY AVERAGES BY COMPANY SIZE IN SALES	
	$249 MILLION OR LESS	$250 MILLION OR MORE
Annual Sales ($ millions)	$ 107	$ 1,703
Total Employees	3,463	18,056
EDP Employees	36	130
EDP Employees as Percent of Total	1.0%	0.7%
EDP Budget ($ Thousands)	1,315	$ 5,747
EDP Budget as Percent of Annual Sales	1.2%	0.3%
EDP Budget Per EDP Employee	$37,822	$57,225
EDP Budget Per Employee	$ 629	$ 713

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EXHIBIT IV-32

RATIO OF EDP BUDGET TO COMPANY SALES:
DISTRIBUTION OF RATIOS AMONG RESPONDENTS
IN THE DISTRIBUTION SECTOR

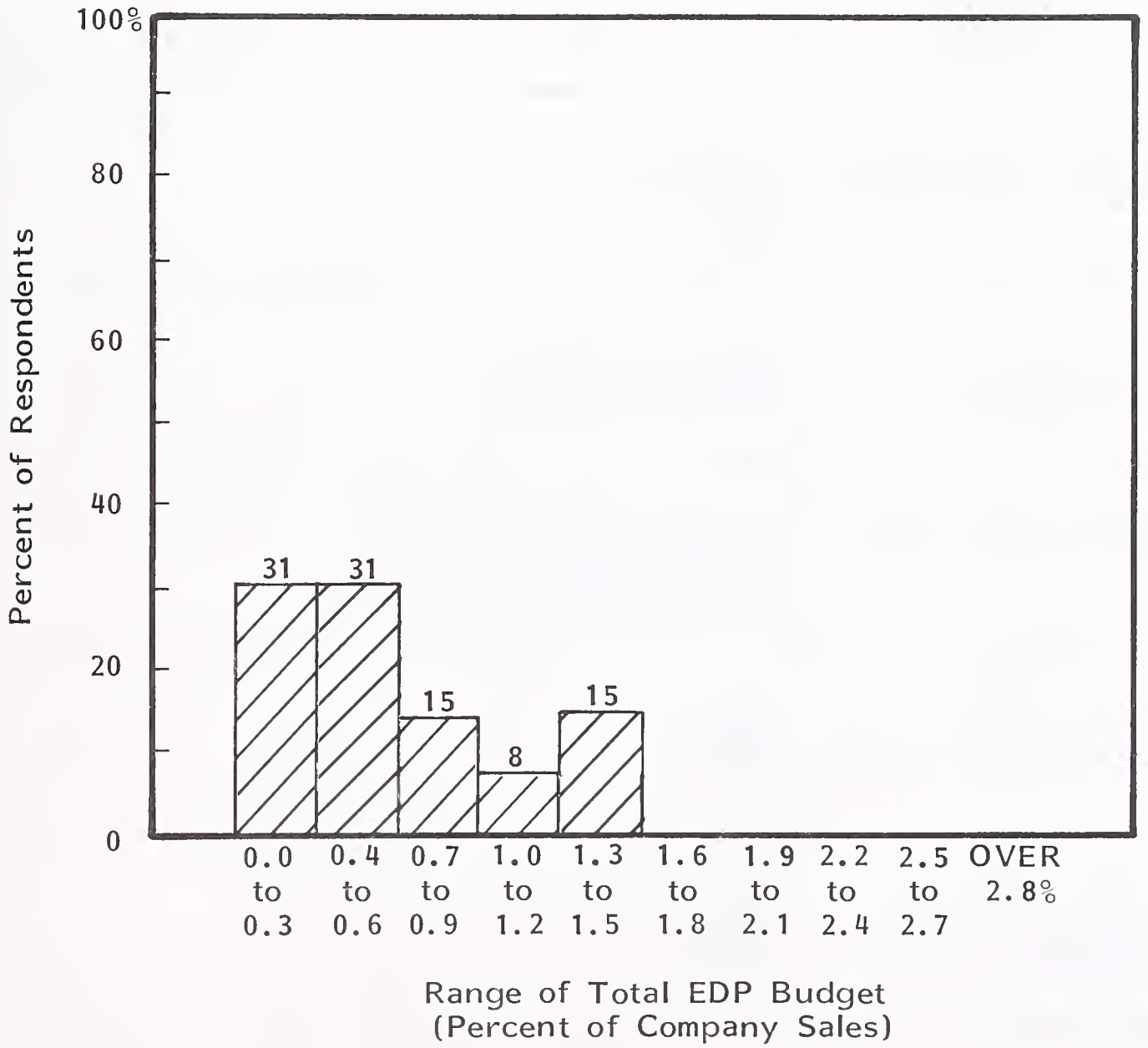

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EXHIBIT IV-33

ACTUAL AND PLANNED EDP BUDGET
GROWTH FOR RESPONDENTS
IN THE DISTRIBUTION SECTOR

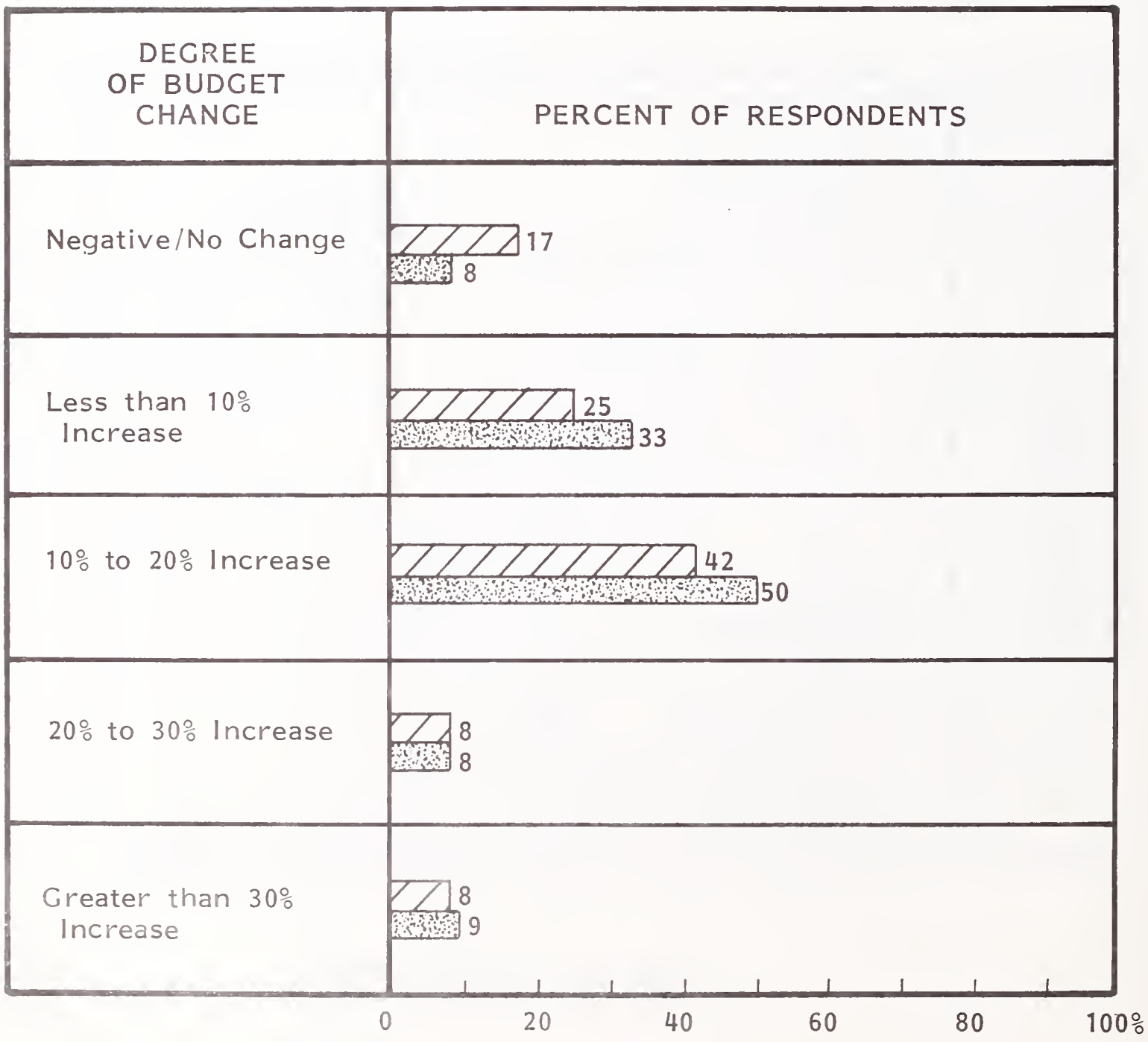

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EXHIBIT IV-34

BREAKDOWN OF INFORMATION SYSTEMS BUDGET
IN THE DISTRIBUTION SECTOR

BUDGET CATEGORY	AMOUNT ($ Thousands)	REPORTED		1982 FORECAST ($ Thousands)	PERCENT CHANGE
		PERCENT OF BUDGET	PERCENT REPORTING*		
Salaries	$2,013	41.7%	92.9%	$2,155	+ 7.1%
EDP Training	57	1.1	57.1	63	+10.5
Non-EDP Training	0	0	0	0	0
Central Site Mainframes	451	19.7	64.3	466	+ 3.3
Central Site Peripherals	466	9.4	43.8	460	+ 3.8
Remote Site Mainframes	1,115	27.4	14.3	1,250	+12.1
Remote Site Peripherals	803	21.5	28.6	929	+15.7
Minicomputers	65	4.4	21.4	70	+ 7.7
Microcomputers/Personal Computers	0	0	0	0	0
Terminals	1,019	15.3	43.8	1,138	+11.6
Communications Hardware and Software	142	2.8	50.0	164	+15.5
Network Expense	119	2.2	50.0	127	+ 6.7
Other Software	146	3.5	42.9	162	+11.0
Vendor Maintenance	144	4.9	64.3	139	- 3.5
Third-Party Maintenance	53	0.8	14.3	51	- 3.8
Outside Services	139	6.8	21.4	130	- 6.5
Data Security	30	1.0	7.1	30	0
Disaster Planning	30	1.0	7.1	30	0
Supplies	351	7.7	85.7	353	+ 0.6

*7% OF RESPONDENTS DECLINED TO PROVIDE BUDGET LINE ITEM DETAILS.

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3. MAJOR PLANS AND PROBLEMS

- Exhibits IV-35 and IV-36 show that the development of on-line systems and related data base systems ranks highest among technological objectives. The proportion reporting these objectives as development priorities is greater than that for the total user community.

- EDP personnel productivity concerns are also ranked higher than in the cross-industry averages.

- The percentages reporting the development of a long-range IS plan as a priority through 1983 are lower than the average for all respondents.

  - Concurrently, the definition of long-range business and IS objectives is reported to be a greater problem in this sector than the average.

- Relationships with end users in the distribution sector are also reported to be a somewhat more severe problem than for the other industry sectors, reflecting the belated entry into data processing for many retail and wholesale establishments.

- The 43.8% of distribution sector respondents mentioning the IS budget as a problem in 1981 is well above the 27.1% average for all sectors.

4. KEY ISSUE STATUS REVIEW

- Applications priorities in the distribution sector show a heavy emphasis on industry specific applications.

- Moreover, this sector more than any other shows a pronounced tendency toward distributed processing.

  - All respondents in this sector report the use of telecommunications systems.

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EXHIBIT IV-35

EDP PLANS FOR RESPONDENTS IN THE DISTRIBUTION SECTOR

(Percent)

PLAN	ON 1981 AGENDA	RANKED FIRST 1981	ON 1982 AGENDA	RANKED FIRST 1982	ON 1983 AGENDA	RANKED FIRST 1983
Develop On-Line Systems	81.3%	31.3%	93.8%	37.5%	37.5%	25.0%
Modify On-Line Systems	18.8	6.3	18.8	6.3	37.5	6.3
Develop Data Base Systems	75.0	31.3	37.5	6.3	56.3	18.8
Modify Data Base Systems	6.3	0	12.5	0	18.8	0
Develop DDP Network	25.0	6.3	18.8	6.3	12.5	0
Modify DDP Network	0	0	12.5	0	6.3	0
Install Word Processing	6.3	0	6.3	6.3	18.8	6.3
Integrate Word Processing and Data Processing	18.8	0	25.0	6.3	25.0	0
Develop Long-Range EDP Plan	12.5	0	6.3	0	6.3	0
Revise Long-Range EDP Plan	18.8	6.3	31.3	0	12.5	0
Integrate EDP Plan with Business Plan	25.0	6.3	12.5	0	37.5	6.3
Improve EDP Personnel Productivity	62.5	12.5	50.0	6.3	56.3	12.5
Measure EDP Personnel Productivity	18.8	0	18.8	0	18.8	0
Convert Hardware System	6.3	0	6.3	0	12.5	0
Convert Operating System	12.5	0	6.3	0	6.3	0
Develop New Batch Applications	31.3	6.3	37.5	18.8	31.3	12.5
Integrate Batch Applications	18.8	0	18.8	0	18.8	12.5
Improve End-User Relations	50.0	6.3	37.5	6.3	25.0	6.3
Other	12.5	0	6.3	0	0	0

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EXHIBIT IV-36

EDP PROBLEMS FOR RESPONDENTS IN THE DISTRIBUTION SECTOR

(Percent)

PROBLEM	MEN-TIONED 1980	RANKED FIRST 1980	MEN-TIONED 1981	RANKED FIRST 1981	PLAN IN PLACE
Long-Range Business Objectives	25.0%	6.3%	37.5%	18.8%	31.3%
Long-Range EDP Objectives	37.5	12.5	56.3	12.5	50.0
Relations with Management	25.0	6.3	18.8	12.5	18.8
Relations with End Users	31.3	12.5	43.8	12.5	31.3
Data Center Operations	18.8	0	25.0	6.3	18.8
Project Planning	25.0	0	25.0	6.3	12.5
Project Scheduling - Estimating	6.3	0	18.8	6.3	6.3
Project Scheduling - Priorities	12.5	0	18.8	0	12.5
System Development Specifications	31.3	6.3	25.0	6.3	25.0
EDP Budget	25.0	0	43.8	0	37.5
Personnel Recruiting	25.0	6.3	25.0	0	25.0
Personnel Training	12.5	0	12.5	6.3	0
Personnel Retention	31.3	6.3	31.3	6.3	18.8
Personnel Productivity	37.5	12.5	62.5	18.8	37.5
Hardware Capacity (CPU)	18.8	0	18.8	6.3	31.3
Hardware Capacity (Disk)	18.8	6.3	37.5	6.3	31.3
Hardware Maintenance	12.5	0	12.5	0	0
System Software	25.0	6.3	12.5	0	0
Network Facilities	25.0	6.3	12.5	0	6.3
Other	0	0	0	0	0

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- The average number of sites linked by telecommunications lines is 18 in 1981, increasing 44% in 1982 to 26, and another 77% in 1983 to 79 locations.

- The percentage of priority applications intended to operate on-line at remote sites is 39.1%, the highest percentage reported by any sector.

- The percentage of priority applications designed to operate in batch mode at remote sites, transmitting summary data to the central site, is 17.2%, almost double the cross-industry average of 9.4%.

- Concomitantly, the sector shows a much higher level of EDP management responsibility for intracompany electronic mail, communicating word processors, wideband transmission, computerized PBXs, and automated network management systems than the cross-industry average.

H. EDUCATION

I. INDUSTRY SECTOR OVERVIEW

- The education sector accounts for an estimated 4.1% of total EDP spending.

- Spending patterns in the education sector are not directly comparable to the rest of the user community because of structural differences:

  - Educational discounts for hardware have been traditional since the inception of the computer industry.

  - Personnel resources in institutions of higher learning are supplemented by members of the undergraduate and graduate student bodies.

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- Innovation in the application of computer solutions is perhaps better received in this sector generally than in any other.

- A major long-term trend that is already having an adverse effect upon growth in this sector is declining enrollment since the post-World War II baby boom peaked in 1980.

- Exhibit IV-37 is a profile summary of respondents in the education sector.

2. BUDGET AND EXPENDITURE ANALYSIS

- The ratio of EDP budgets to institutional budget authority, as shown in Exhibit IV-38, has a decided skew toward the high side.

  - In virtually all technical curricula, applied data processing concepts are increasingly becoming an integral part of course work, especially in the sciences, engineering, and business.

- Sixty-eight percent of respondents anticipate 1982 budget increases under 20%, as compared with 89% in this group last year, as shown in Exhibit IV-39.

- Exhibit IV-40 shows that the largest percentage increases are expected in the areas of personal computers, other software, third-party maintenance, data security, and terminals.

3. MAJOR PLANS AND PROBLEMS

- As in the case of all other industry sectors, the development of on-line and data base systems are priority objectives, as shown in Exhibit IV-41.

- Integration of data processing with word processing will be rising in importance over the next two years.

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EXHIBIT IV-37

RESPONDENT PROFILE - EDUCATION SECTOR

PROFILE CHARACTERISTIC	AVERAGES FOR ALL SIZES OF ORGANI-ZATION
Annual Revenue ($ millions)	$ 43
Total Employees	2,293
EDP Employees	31
EDP Employees as Percent of Total	1.3%
EDP Budget ($ Thousands)	$ 1,093
EDP Budget as Percent of Annual Revenue	2.1%
EDP Budget Per EDP Employee	$37,475
EDP Budget Per Employee	$807

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EXHIBIT IV-38

RATIO OF EDP BUDGET TO ANNUAL BUDGET AUTHORITY:
DISTRIBUTION OF RATIOS AMONG RESPONDENTS
IN THE EDUCATION SECTOR

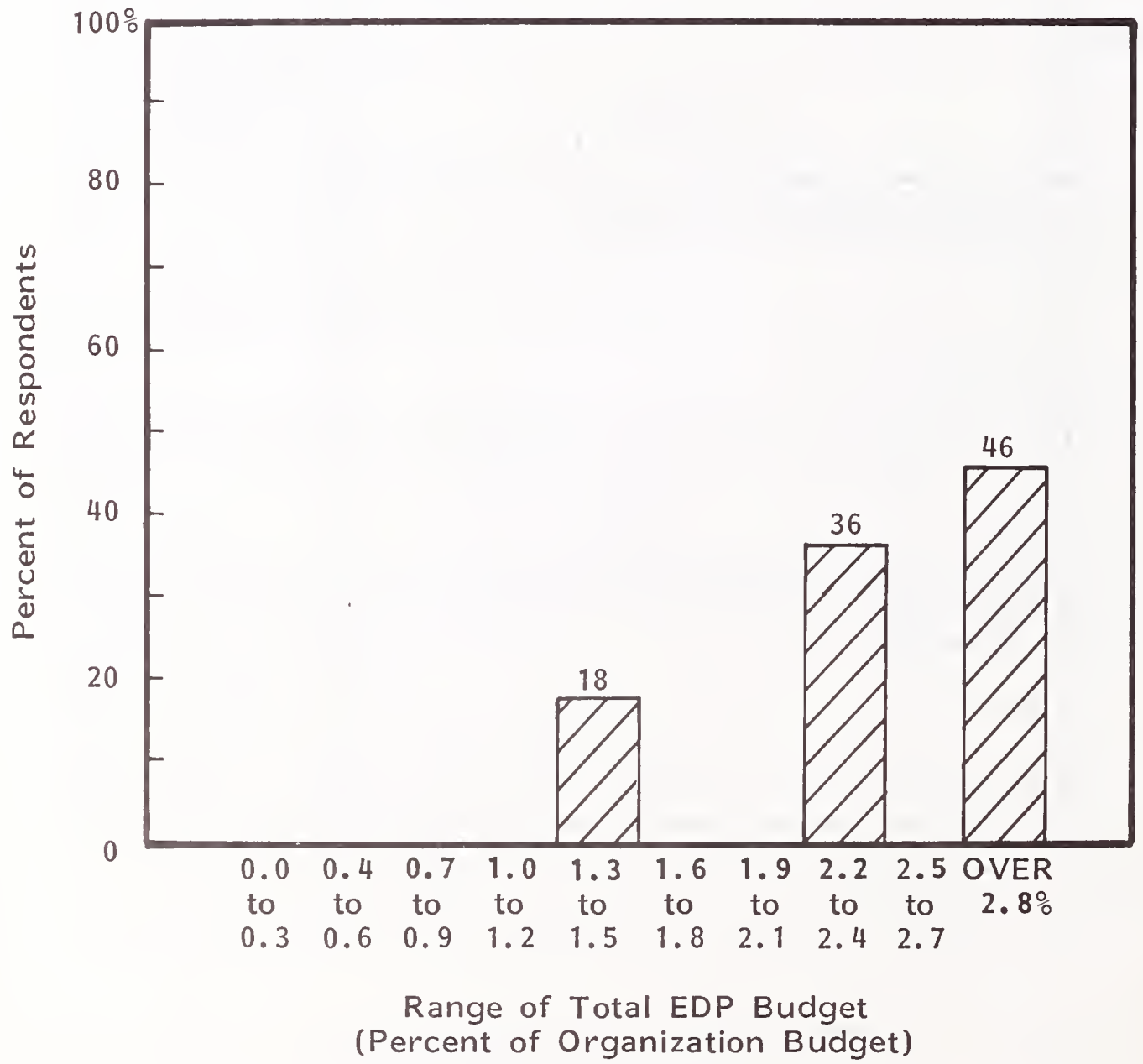

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EXHIBIT IV-39

ACTUAL AND PLANNED EDP BUDGET
GROWTH FOR RESPONDENTS
IN THE EDUCATION SECTOR

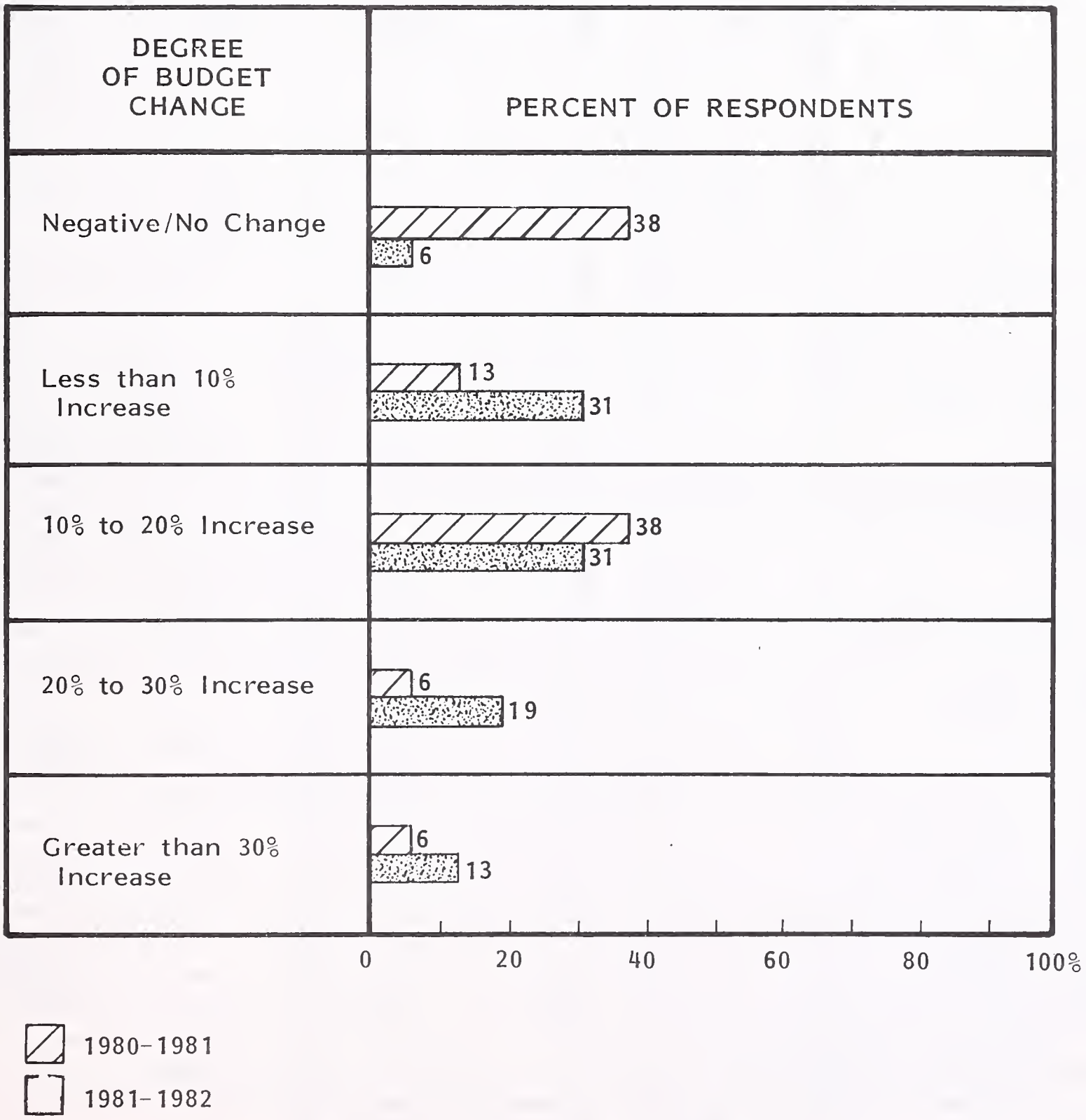

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EXHIBIT IV-40

BREAKDOWN OF INFORMATION SYSTEMS BUDGET IN THE EDUCATION SECTOR

BUDGET CATEGORY	AMOUNT ($ Thousands)	REPORTED		1982 FORECAST ($ Thousands)	PERCENT CHANGE
		PERCENT OF BUDGET	PERCENT REPORTING*		
Salaries	$ 1,041	47.0%	100.0%	$ 1,077	+ 3.5%
EDP Training	9	1.1	46.7	11	+ 22.2
Non-EDP Training	0	0	0	0	0
Central Site Mainframes	253	18.8	66.7	269	+ 2.7
Central Site Peripherals	65	9.1	60.0	66	+ 1.5
Remote Site Mainframes	*	-	-	-	0
Remote Site Peripherals	9	1.5	6.7	9	0
Minicomputers	79	3.0	20.0	57	- 27.8
Microcomputers/Personal Computers	10	1.5	33.3	22	+120.0
Terminals	26	3.8	73.3	33	+ 26.9
Communications Hardware and Software	43	3.4	40.0	42	- 2.3
Network Expense	3	0.4	20.0	3	0
Other Software	22	4.3	40.0	30	+ 36.3
Vendor Maintenance	72	11.2	73.3	75	+ 4.1
Third-Party Maintenance	44	6.0	26.7	59	+ 34.1
Outside Services	20	3.4	40.0	23	+ 15.0
Data Security	45	9.8	6.7	68	+ 51.1
Disaster Planning	11	0.3	13.3	16	+ 45.5
Supplies	88	11.9	86.7	90	+ 2.2

*SINGLE RESPONDENTS, NO CENTRAL SITE MAINFRAMES; DATA DISREGARDED

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EXHIBIT IV-41

EDP PLANS FOR RESPONDENTS IN THE EDUCATION SECTOR

(Percent)

PLAN	ON 1981 AGENDA	RANKED FIRST 1981	ON 1982 AGENDA	RANKED FIRST 1982	ON 1983 AGENDA	RANKED FIRST 1983
Develop On-Line Systems	75.0%	6.3%	81.3%	31.3%	43.8%	25.0%
Modify On-Line Systems	12.5	6.3	18.8	6.3	56.3	6.3
Develop Data Base Systems	37.5	12.5	56.3	25.0	37.5	18.8
Modify Data Base Systems	18.8	0	25.0	6.3	31.3	6.3
Develop DDP Network	25.0	0	25.0	6.3	12.5	6.3
Modify DDP Network	25.0	0	18.8	0	12.5	0
Install Word Processing	18.8	0	25.0	0	18.8	6.3
Integrate Word Processing and Data Processing	12.5	0	31.3	6.3	43.8	12.5
Develop Long-Range EDP Plan	12.5	6.3	12.5	6.3	18.8	6.3
Revise Long-Range EDP Plan	43.8	0	50.0	6.3	68.8	6.3
Integrate EDP Plan with Business Plan	37.5	6.3	18.8	6.3	18.8	0
Improve EDP Personnel Productivity	31.3	6.3	50.0	6.3	31.3	0
Measure EDP Personnel Productivity	18.8	6.3	31.3	0	43.8	12.5
Convert Hardware System	43.8	6.3	6.3	0	12.5	0
Convert Operating System	31.3	12.5	12.5	0	6.3	0
Develop New Batch Applications	18.8	6.3	18.8	0	25.0	0
Integrate Batch Applications	25.0	6.3	25.0	0	31.3	6.3
Improve End-User Relations	50.0	0	62.5	0	56.3	6.3
Other	25.0	18.8	12.5	12.5	0	0

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- The definition of long-range EDP objectives appears to be the most pressing concern in this sector, as shown in Exhibit IV-42.

  - This is probably related to the contrary trends in EDP budgets and computer capacity requirements as demographic trends indicate a reversal of two decades of enrollment growth.

4. KEY ISSUE STATUS REVIEW

- The most frequently mentioned priority applications involve the administration of school functions.

  - Systems to maintain student records, student financial aid, and class scheduling fall within this category.

  - Unusual applications for this sector, including hospital patient care, hospital bed availability, and Medicare cost allocation, reflect the administration of teaching hospitals and medical schools.

- The integration of word processing with data processing, as reported by 24% of respondents in this sector, represents the highest percentage of any industry sector.

- As may be expected, research and development applications and engineering applications are applications development priorities.

- The education sector reports the highest proportion of respondents selling computer resources to outside organizations.

  - The 35.3% indicating sale of batch computer time is almost double the cross-industry average of 19.2%.

  - Twice as many sell on-line time, at 24.4%, as all respondents, who average 12.1%.

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EXHIBIT IV-42

EDP PROBLEMS FOR RESPONDENTS IN THE EDUCATION SECTOR

(Percent)

PROBLEM	MEN-TIONED 1980	RANKED FIRST 1980	MEN-TIONED 1981	RANKED FIRST 1981	PLAN IN PLACE
Long-Range Business Objectives	31.3%	6.3%	25.0%	6.3%	0
Long-Range EDP Objectives	75.0	18.8	62.5	18.8	56.3
Relations with Management	25.0	12.5	31.3	12.5	18.8
Relations with End Users	25.0	6.3	43.8	6.3	18.8
Data Center Operations	31.3	0	25.0	6.3	25.0
Project Planning	31.3	12.5	31.3	6.3	25.0
Project Scheduling - Estimating	12.5	0	18.8	0	6.3
Project Scheduling - Priorities	12.5	0	18.8	6.3	12.5
System Development Specifications	43.8	6.3	50.0	0	18.8
EDP Budget	43.8	6.3	43.8	6.3	12.5
Personnel Recruiting	25.0	6.3	31.3	12.5	18.8
Personnel Training	18.8	0	18.8	0	12.5
Personnel Retention	18.8	0	25.0	6.3	18.8
Personnel Productivity	6.3	0	18.8	0	6.3
Hardware Capacity (CPU)	50.0	18.8	43.8	6.3	50.0
Hardware Capacity (Disk)	31.3	6.3	18.8	6.3	18.8
Hardware Maintenance	12.5	0	6.3	0	12.5
System Software	18.8	0	18.8	6.3	18.8
Network Facilities	18.8	0	18.8	0	6.3
Other	6.3	0	6.3	0	12.5

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- The 6% proportion selling access to proprietary data bases is half again as great as the 3.8% cross-industry average.

- Overall use of office automation components by the educational sector is generally below the cross-industry average.

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APPENDIX A: CHANGE IN METHODOLOGY AND SURVEY SAMPLE

APPENDIX A: CHANGE IN METHODOLOGY AND SURVEY SAMPLE

A: REFINEMENTS IN FORECAST

- For several years, INPUT has been forecasting various components of EDP expenditures, both separately and in the aggregate.

  - The litmus test for validity of the forecasts has been a reference to corporate sales, on the basis that most organizations track and budget their expenditures as a proportion of corporate sales or the equivalent.

- This has introduced distortions into the forecast, which it was thought better to address squarely by a revision of the bases for the forecasts.

  - The alternative would have been to introduce a series of adjustments which would add to the complexity of the process without illuminating the underlying decision factors that lead to budgetary changes.

- For example, despite a sturdy 16.7% increase in reported EDP expenditures for 1981, the proportion of expenditures has declined compared to companies' prior year's sales, while the opposite appears likely as a percentage of 1981 sales.

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- The U.S. gross national product (GNP) grew 8.8% nominally in 1980 but declined 0.2% in real terms, as 5.8% and 11.2% drops in automobile production and residential investment, respectively, were barely offset by 12% to 19% gains in other components of the GNP.

- The weak economic performance domestically was reflected in the weakness of the U.S. dollar during that year. The favorable exchange rate resulted in the translation of companies' overseas sales into a higher than anticipated level of dollars.

- Thus, total corporate sales (domestic and foreign), expressed in U.S. dollars, rose faster than EDP budgets.

- By the same token, an estimated 11.3% nominal (2.1% real) increase in the GNP in 1981, coupled with an anticipated adverse exchange rate, is likely to result in a sharp increase in the proportion of EDP expenditures to reported 1981 corporate sales. (On a trade-weighted basis, the U.S. dollar has risen 14% over the past twelve months, and is unlikely to decline by any significant amount through year end.)

• In fact, it is the revenue figure which is experiencing rapid and somewhat arbitrary changes, rather than the EDP budget figure.

• The misleading volatility of U.S. EDP budgets as a percentage of corporate worldwide revenues suggests that a more meaningful estimator of total EDP spending in the U.S. would be its relation to the domestic gross national product.

  - The dependency of reported non-U.S. sales on changes in currency translation rates, as mandated by the Financial Accounting Standards Board (FASB) in its Statement No. 8, is the main reason for the apparent major swings in reported sales of U.S.-based multinational firms.

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- For domestic planning purposes, the distortions induced by this accounting technique serve merely to confuse the issue, as the proportion of overseas sales to domestic sales varies widely among industries and among individual firms within each industry sector.

- Accordingly, INPUT has begun to relate domestic EDP spending to domestic business activity, as measured by GNP data developed by the U.S. Department of Commerce.

- A second refinement that INPUT is introducing to this annual forecast of EDP expenditures is the narrowing of budget discussions to those items which fall within the scope of the existing responsibilities of traditional EDP departments.

  - Thus, of the $54 to $56 billion that INPUT estimates was spent in 1980 for EDP and data communications in the U.S., organizations other than corporate EDP departments accounted for roughly $9 to $11 billion, or 17% to 20% of the total.

  - On this basis, we estimate that EDP spending from EDP budgets in the U.S. was $44.7 billion in 1980, or 1.70% of the GNP, and will rise 12.5% and 13% respectively in 1981 and 1982 to $50.3 billion and $56.8 billion, or 1.72% and 1.75% of U.S. gross national product in those years.

- A third modification in this year's report is the regrouping of companies for analytical purposes from three size categories to two.

  - The inflation that accelerated since the latter 1970s has shifted the boundary between mature, established firms and emerging companies from $100 million in sales to about $250 million.

  - An increasing number of respondents reporting sales of between $250 million and $1 billion are responding as subsidiaries or divisions of larger organizations. Moreover, those that are not subsidiaries have

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increasingly displayed organizational and operational characteristics that have become much less distinguishable from those of firms with sales exceeding $1 billion.

B. REFORMULATION OF SURVEY SAMPLE

- In recognition of the business characteristics of INPUT's client base, continuing efforts are being devoted toward making the information presented in this series of reports more directly applicable to client situations.

- Particularly, most client organizations are at or near the larger end of their industry group in terms of sales, assets, or the equivalent, and some industry categories have no representative whatsoever.

- Consequently, the stratification of the survey population has been recast to more closely reflect the INPUT clients to whom this survey report is addressed.

  - Caution should be exercised when comparing information from this report to apparently similar information from previous years' reports, to avoid drawing statistically unsupportable conclusions across different survey populations.

- Exhibit A-1 shows the survey sample in each industry and category for this year's survey population.

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EXHIBIT A-1

INTERVIEW PROGRAM

INDUSTRY SECTOR	TOTAL RESPON-DENTS	REVENUE/ ASSETS > $250 MILLION	REVENUE/ ASSETS < $250 MILLION
Discrete Manufacturing	50	19	31
Process Manufacturing	42	26	16
Finance (Banking and Brokerage)	16	8	8
Insurance	23	12	11
Transportation and Utilities	14	11	3
Distribution	16	10	6
Education	17	1	16
Government	22	3	19
Services and Other	40	10	30
Total	240	100	140

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APPENDIX B: QUESTIONNAIRE

CATALOG NO. U A 8 1 | | | |

INPUT CONFIDENTIAL

INFORMATION SYSTEMS DIRECTOR QUESTIONNAIRE - 1981

Company Name _____

Address _____

_____

_____

Parent Company Name (if applicable) _____

Respondent's Name _____

Title _____

Telephone Number _____

Mailing Address (if different from above) _____

_____

_____

_____

Thank you very much for participating in this survey. Please be assured that the identity of your company will be kept confidential.

☐ Check here if you would like to receive a copy of last year's survey results.

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INDUSTRY ORIENTED APPLICATIONS

Code	
	Manufacturing
11	Material requirements planning (MRP)
12	CAD/CAM
13	Shop floor control
14	On-line receiving
15	Engineering applications other than CAD/CAM
16	Research and development applications
17	Oil and gas production accounting
18	Product movement
19	Operations cost reporting
	Transportation
21	Network control
22	Yard terminal systems
23	Equipment dispatching
24	Equipment control
25	Maintenance scheduling
	Utilities
31	Energy management
32	Customer information systems
33	Responsibility accounting
34	Engineering applications
	Banking – Commercial
41	On-line deposits
42	Money transfer
43	Foreign exchange
44	Corporate trust accounting
	Banking – Savings and Loan
45	Mortgage servicing
46	NOW account processing
47	Personal trust accounting
	Insurance
51	Claims processing
52	Automated claims adjudication
53	Policy management
54	Branch office systems
55	Agency support
56	Commercial lines policy writing
57	Health claims systems
58	On-line casualty systems
59	Group insurance systems
	Distribution
61	Merchandise information systems
62	Warehouse receiving
63	Point-of-sale systems

Code	
	Government
71	Withholding tax systems
72	Law enforcement systems
73	Vehicle maintenance
74	Automated land management
	Services
81	Alarm monitoring
82	On-line credit search
83	Hospital patient care
	Education, Medical
91	Student records
92	Fund raising
93	Student financial aid
94	Student scheduling
95	Computer assisted instruction
96	Bed availability
97	Medicare cost allocation
98	Laboratory reporting
	Common Applications
101	Billing
102	Accounts receivable
103	Sales analysis
104	Order entry
105	Payroll
106	Labor distribution
107	Accounts payable
108	General ledger
109	Cost accounting
110	Purchase order writing
111	Receiving
112	Shipping
113	Personnel records
114	Fixed asset accounting
115	Equipment maintenance
116	Facilities maintenance
117	Budget administration
118	Tax reporting
119	Government reporting
120	Shareholder records
121	Mailing lists
122	Statistical analysis
123	Word processing
124	Remote job entry

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INFORMATION SYSTEMS DIRECTOR QUESTIONNAIRE

CATALOG NO. U A 8 1 | | | |

A. GENERAL INFORMATION

1. Are you responding for a subsidiary, division, or agency? ☐ Yes ☐ No If no, please skip to Question 4.
2. Is the primary responsibility of your subsidiary/division/agency the provision of data processing services to the rest of the organization? ☐ Yes ☐ No
3. Please supply the following data for your subsidiary/division/agency only. SIC code (if known)_____
   Primary business or activity of your organization/agency _____
   Annual revenues ($ million)_____ or Assets ($ million)_____ or Budget ($ million)_____
   Annual selling, general, and administrative (SG&A) expenses ($ million)_____
   Total number of employees_____ Number of EDP employees_____
4. Please supply the following data for your entire organization.
   Primary business or activity of your organization_____ SIC code (if known)_____
   Annual revenues ($ million)_____or Assets ($ million)_____or total budget authority ($ million)_____
   Annual SG&A expenses ($ million)_____Total number of employees_____Number of EDP employees_____
   Is your EDP organization considered ☐ a cost center, or ☐ a profit center? Typical programmer/analyst chargeback $_____/hr.
   Do you allocate costs by: ☐ Size of user ☐ Usage of resources ☐ Transaction volume ☐ Other?

B. EDP ORGANIZATION

5. Please indicate the number of EDP employees by position for your subsidiary/division/agency (if applicable) and for your entire organization (if known), as well as the number of positions you are authorized to fill this year, according to the following classification:

POSITION	YOUR SUBSIDIARY/DIVISION/AGENCY				TOTAL ORGANIZATION			
	Staffed		Open		Staffed		Open	
	EDP Budget	End-user Budget	EDP Budget	End-user Budget	EDP Budget	End-user Budget	EDP Budget	End-user Budget
Managers								
Non-management supervisory								
Communications specialists								
Programmer/analysts								
Analysts								
Programmers								
Documenters, technical writers								
Technical support personnel								
Other support personnel								
Operations personnel								
Data entry personnel								
Other (specify)								

6. What best describes the organization of your EDP department (i.e., are you organized in separate development and maintenance groups, by line of business, by DP function, etc.)?
   Your subsidiary/division/agency_____
   Parent organization _____
7. A major problem facing EDP management is the increasing shortage of skilled personnel. What specific steps has your organization taken to insure a satisfactory retention rate for key EDP employees?_____
   _____
   _____
8. What steps have you taken to purge less than satisfactory performers?_____
   _____
9. What specific personnel trend do you see affecting your organization the most, either favorably or unfavorably, over the next five years? _____
   _____
   _____

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C. EDP PROBLEMS

10. What are the most significant problems you face in 1981? (Rank the top five in order of priority: 1 through 5, 1 being most important, 2 second, etc., and indicate whether you have a plan in place to address the problem.)

CATEGORY	PRIORITY RANKING		PLAN IN PLACE	
	Last Year	This Year	Yes	No
Long-range business objectives			☐	☐
Long-range EDP objectives			☐	☐
Relations with management			☐	☐
Relations with end-users			☐	☐
Data center operations			☐	☐
Project planning			☐	☐
Project scheduling — estimating			☐	☐
Project scheduling — priorities			☐	☐
System development specifications			☐	☐
EDP budget			☐	☐
Personnel recruiting			☐	☐
Personnel training			☐	☐
Personnel retention			☐	☐
Personnel productivity			☐	☐
Hardware capacity (CPU)			☐	☐
Hardware capacity (disk)			☐	☐
Hardware maintenance			☐	☐
Systems software			☐	☐
Network facilities			☐	☐
Other (specify) _____			☐	☐
_____			☐	☐

D. EDP PLANS

11. What are your primary objectives and priorities for the next three years? (Rank the top five in order of priority: 1 through 5, 1 being most important, 2 second, etc., for each of the three years.)

CATEGORY	PRIORITY RANKING		
	1981	1982	1983
Develop new on-line systems			
Modify existing on-line systems			
Develop new data base systems			
Modify existing data base systems			
Develop new DDP network			
Modify existing DDP network			
Install word processing			
Integrate word and data processing			
Develop long-range EDP plan			
Revise long-range EDP plan			
Integrate long-range EDP plan with business plan			
Improve EDP personnel productivity			
Measure EDP personnel productivity			
Convert hardware system			
Convert operating system			
Develop new batch applications			
Integrate batch applications			
Improve end-user relations			
Other (specify)			

E. EDP APPLICATIONS

12. The reverse side of the cover sheet accompanying this questionnaire is a representative, but by no means exhaustive, list of applications that the 1980 User Panel respondents cited among their top five applications development priorities for 1980. Using this list as a guide, please indicate the five most important applications development priorities for your organization in 1981.

Priority	Code or Name of Application	Estimated Cost to Develop	Estimated Annual Cost To Run	Estimated Payback Period (months)	Developed In-house	Purchased	TO RUN AT CENTRAL SITE		TO RUN AT REMOTE SITE			
							Batch	On-line	Batch (Stand-Alone)	Batch (Summary Data Transmitted to Central Site)	On-Line	Number of Sites
1					☐	☐	☐	☐	☐	☐	☐	☐
2					☐	☐	☐	☐	☐	☐	☐	☐
3					☐	☐	☐	☐	☐	☐	☐	☐
4					☐	☐	☐	☐	☐	☐	☐	☐
5					☐	☐	☐	☐	☐	☐	☐	☐

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13. What is the approximate number of new development application systems for which you are responsible?_____

	TYPICALLY	RANGE	
		MINIMUM	MAXIMUM
Size of system (number of separate programs)			
Size of program (number of lines of source code)			
Duration of system implementation effort (elapsed number of months)			
Staffing requirements to develop (work - months) per system			

Number of programs under active maintenance _____

Approximate total lines of code under active maintenance _____

Staffing requirements to maintain (work - months per year) per system _____

14. What is the most significant industry event that affected your applications development in the last twelve months?_____

_____

_____

15. What research or information would be most helpful to your development or planning efforts?_____

_____

_____

16. Did you, or do you ever plan to, integrate word processing with data processing? ☐Done ☐Plan to do ☐Will not do ☐Undecided

Did you,or do you ever plan to, integrate CAD/CAM with data processing? ☐Done ☐Plan to do ☐Will not do ☐Undecided

F. EDP BUDGET

17. What is your total EDP budget for 1981? $_____,_____,000. 18. What was it in 1980? $_____,_____,000.

19. By how much will your budget change from 1981 to 1982? ☐Increase +_____% ☐Decrease -_____% ☐No change

What inflation rate is included in the above percentage? _____%

20. Please categorize how your 1981 EDP budget will be spent and how this breaks down between central and remote sites. Also indicate how much you expect specific categories to increase or decrease in 1982.

CATEGORIES	Not Included in EDP Budget	1981 TOTAL BUDGET			ANTICIPATED PERCENT OF CHANGE IN 1982		
		Amount	Percent Central	Percent Remote	Increase	Decrease	Percent
Personnel salaries	☐	$_____,_____,000	%	%	☐	☐	%
EDP personnel training	☐	$_____,_____,000	%	%	☐	☐	%
Non-EDP personnel training	☐	$_____,_____,000	%	%	☐	☐	%
Mainframe processors: central	☐	$_____,_____,000	%	%	☐	☐	%
Mainframe processors: remote	☐	$_____,_____,000	%	%	☐	☐	%
Peripherals: central	☐	$_____,_____,000	%	%	☐	☐	%
Peripherals: remote	☐	$_____,_____,000	%	%	☐	☐	%
Minicomputers	☐	$_____,_____,000	%	%	☐	☐	%
Microcomputers/personal computers	☐	$_____,_____,000	%	%	☐	☐	%
Terminals	☐	$_____,_____,000	%	%	☐	☐	%
Communications hardware & software	☐	$_____,_____,000	%	%	☐	☐	%
Network expense (line cost only)	☐	$_____,_____,000	%	%	☐	☐	%
Other software (purchase or lease)	☐	$_____,_____,000	%	%	☐	☐	%
Vendor maintenance (hardware & software)	☐	$_____,_____,000	%	%	☐	☐	%
Third party maintenance (hardware & software)	☐	$_____,_____,000	%	%	☐	☐	%
Outside processing services	☐	$_____,_____,000	%	%	☐	☐	%
Data security	☐	$_____,_____,000	%	%	☐	☐	%
Disaster planning/contingency	☐	$_____,_____,000	%	%	☐	☐	%
Supplies & other	☐	$_____,_____,000	%	%	☐	☐	%

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21. What is your estimate of the annual amount of those items you marked as not included above $_____,_____, 000

22. Are any of the expenditures in your budget for turnkey systems which combine hardware and applications software on a "ready-to-use" basis? ☐ Yes ☐ No If yes, how much is allocated for such systems? $_____,_____, 000

G. EDP HARDWARE

23. Please indicate the number of systems installed and on order for central and remote sites.

VENDOR AND MODEL NUMBER	INSTALLED				ON ORDER				
	Total Now		To be Removed/ Replaced This Year		Total		To be Installed This Year		System(s) to be Replaced (if any)
	Central Site	Remote Site	Central Site	Remote Site	Central Site	Remote Site	Central Site	Remote Site	
IBM SYSTEMS									
3081									
3033 MP									
3033 AP									
3033 UP									
3033 N									
3032									
3031 AP									
3031 UP									
370/158-168 MP									
370/158-168 AP									
370/158-168 UP									
4341 Model Group 2									
4341 Model Group 1									
4331 Model Group 2									
4331 Model Group 1									
8100									
Other System/370									
System/360									
Series/1									
System/3									
System/32, 34									
System/38									
5100, 5110, 5120									
AMDAHL SYSTEMS									
580									
470 V/8									
470 V/7									
470 V/7-A									
470 V/7-B									
470 V/6									
BURROUGHS									
B 6900									
B 6800-7800									
B 6700-7700									
B 2900-3900									
B 2800/3800/4800									
Other Burroughs									
CONTROL DATA									
3000 Series									
Cyber 170 700 Series									
Omega/480									
Other CDC									
DATA GENERAL									
MV/8000									
Eclipse									
Other Data General									

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VENDOR AND MODEL NUMBER	INSTALLED				ON ORDER				
	Total Now		To be Removed/ Replaced This Year		Total		To be Installed This Year		System(s) to be Replaced (if any)
	Central Site	Remote Site	Central Site	Remote Site	Central Site	Remote Site	Central Site	Remote Site	
DIGITAL EQUIPMENT									
DEC System 10									
DEC System 20									
VAX 11/780									
VAX 11/750									
Large PDP-11									
Other DEC									
HONEYWELL									
DPS/8									
DPS/6									
DPS/4									
Series 60 Level 66/68									
Series 60 Level 64									
Series 60 Level 62									
Series 60 Level 6									
Other Honeywell									
NCR									
8400-8500									
8200									
Other NCR									
SPERRY UNIVAC									
11/82-84									
1100/81									
1100/42-44									
1100/41									
1100/60									
Series 90/80									
Series 90/70									
Series 90/60									
System 80									
BC-7									
Other UNIVAC									
OTHER MANUFACTURERS									
Vendor / Model									

24. Is your EDP system a telecommunications system? ☐ Yes ☐ No If no, do you anticipate going on-line within the next three years? ☐ Yes ☐ No If no, skip to Question 29.
25. What types of equipment do/will you use to interface the network with the CPU(s)? ☐ Hard-wired controller(s) Model(s)_____ ☐ Programmable front-end communications processor(s) Model(s)_____
26. What types of network interface equipment do you plan to install in the future?_____
27. How many locations in your organization presently have computers linked to others by telecommunications lines?_____ By how many will this number increase by yearend 1981?_____ by yearend 1982?_____
28. In what year did/will your telecommunications system become operational?_____
29. What operating system(s) are you presently using?_____

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30. What network control program(s) are you presently using?_____

31. If you are an IBM user and are not currently using MVS or DOS/VSE, when do you anticipate converting to ☐ MVS: 198_____ and/or ☐ DOS/VSE? 198_____

32. Please indicate the number of the following that you have installed or are planning to install.

PRODUCT TYPE	INSTALLED				PLANNED				
	Total Now		To be Removed/ Replaced in 1981		To be Installed				
					1981		1982		After 1982
	Central Site	Remote Sites	Central Site	Remote Sites	Central Site	Remote Sites	Central Site	Remote Sites	
A. Minicomputers/microcomputers/small business systems/personal computers: a. Priced at $1,500 or less									
b. Priced at $1,501 – $15,000									
c. Priced at $15,001 – $150,000									
d. Priced at $150,001 +									
B. Intelligent terminals or terminal cluster controllers									
C. Non-intelligent terminals									

33. Please indicate the reasons for selecting the hardware (i.e., non-mainframe computers, end-user equipment) listed in Question 32.

CRITERION	IMPORTANCE					BY 1985, WILL THE IMPORTANCE OF THIS CRITERION		
	Not Important	Of Some Importance	Important	Very Important	Most Important	Increase	Decrease	Stay the Same
Price of hardware	☐	☐	☐	☐	☐	☐	☐	☐
Price of maintenance	☐	☐	☐	☐	☐	☐	☐	☐
Availability of software	☐	☐	☐	☐	☐	☐	☐	☐
Reliability of hardware	☐	☐	☐	☐	☐	☐	☐	☐
Quality of maintenance	☐	☐	☐	☐	☐	☐	☐	☐
Compatibility with currently installed hardware	☐	☐	☐	☐	☐	☐	☐	☐
Hardware features	☐	☐	☐	☐	☐	☐	☐	☐
Estimated uptime	☐	☐	☐	☐	☐	☐	☐	☐
Quality of sales effort	☐	☐	☐	☐	☐	☐	☐	☐
Reputation of manufacturer	☐	☐	☐	☐	☐	☐	☐	☐

H. OUTSIDE COMPUTER SERVICES AND EXPENDITURES

34. Does your company purchase outside computer services that are not under the control of the EDP organization? ☐ Yes ☐ No

35. If yes, what are the approximate annual expenditures for these services in 1980 $_____,_____, 000, 1981 $_____,_____, 000, and 1982 $_____,_____, 000?

36. Who purchases these outside services?

☐ Finance _____ %
☐ Corporate _____ %
☐ Personnel _____ %
☐ R&D _____ %
☐ Engineering _____ %
☐ Operations/Manufacturing _____ %
☐ Marketing/Sales _____ %
☐ Other _____ _____ %

37. Do you plan to replace these services with in-house alternatives? ☐ Yes ☐ No 38. If yes, when, and which? _____

39. If no, what would prevent or hinder their implementation in-house? _____

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40. Do you provide computer services to others outside your organization? ☐ Yes ☐ No

41. If yes, please specify:

- ☐ Sale of computer-based resources
  - ☐ Batch mode — Average number of hours per week _____ hr./wk.
  - ☐ On-line mode — Average number of hours per week _____ hr./wk.
  - ☐ Raw power (customer supplies programs and data)
  - ☐ Processing (your programs, customer supplies data)
  - ☐ Access to or use of your proprietary data base(s)
- ☐ Retainer for use of your system(s) as backup for customer's system(s)
- ☐ Sale of programs developed in-house
- ☐ Rental or lease of programs developed in-house

I. UTILIZATION ISSUES

42. What percent of your computer resources are used for:

Production runs	_____ %
New applications development	_____ %
Maintenance of existing programs	_____ %
Enhancement/upgrade of existing programs	_____ %
Other (specify)_____	_____ %

43. What percent of your applications programmers are assigned to:

	1980	1981	1982
New program development	_____ %	_____ %	_____ %
Maintenance of existing programs	_____ %	_____ %	_____ %
Enhancement/upgrade of existing programs	_____ %	_____ %	_____ %
Production/user support, troubleshooting	_____ %	_____ %	_____ %
Other	_____ %	_____ %	_____ %

44. Do you have a dedicated applications development computer? ☐ Yes ☐ No

45. What measures are you taking to reduce the time and costs associated with program development? _____

_____

_____

46. What level of improvement (measured in terms of shortening the development cycle) do you estimate these measures will provide? ☐ 1 - 10% ☐ 11 - 20% ☐ 21 - 50% ☐ 51 - 75% ☐ More than 75%
How much do you need? ☐ 1 - 10% ☐ 11 - 20% ☐ 21 - 50% ☐ 51 - 75% ☐ More than 75%

47. What is the total number of 8-hour shifts per week (maximum 21 per CPU) that you have your systems operating? _____

48. Of these, how many are primarily batch mode shifts? _____

49. What operating system(s) do you use when in batch mode? _____

50. How many shifts do you run primarily or substantially in on-line mode? _____

51. What operating system(s) do you use when in on-line mode? _____

52. How many end-user stations do you support directly in on-line mode ☐ full-time (or nearly) _____ ☐ occasionally _____

J. EQUIPMENT FROM JAPAN

53. If Japanese equipment manufacturers were to market computer and related products directly in the United States, would you consider purchasing these products? ☐ Yes ☐ No

54. If Japanese equipment manufacturers were to market these products through United States distributors, would you consider acquiring these products? ☐ Yes ☐ No

55. Do you currently use Japanese computer products? ☐ Yes ☐ No

56. If yes, which products (manufacturer and model no.)? _____

_____

57. What other Japanese computer products are you likely to acquire within the next two years? _____

_____

58. What are your opinions with respect to Japanese computer equipment in the following areas:

PRODUCT TYPE	We Have Now	Plan to Purchase	No Plans	RELIABILITY					PRICE/PERFORMANCE					MAINTENANCE				
				Poor	Fair	Good	Very Good	No Opinion	Poor	Fair	Good	Very Good	No Opinion	Poor	Fair	Good	Very Good	No Opinion
Mainframes	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Minicomputers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Printers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other peripherals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Terminals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Word processing equipment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Software	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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K. OFFICE OF THE FUTURE ISSUES

59. Please check which of the office automation and communications services listed below are currently being used or planned and indicate whether the EDP department has management responsibility for them.

CATEGORY	STATUS/PLANS					EDP RESPONSIBILITY/PLANS				
	Using it Now	In 1981-1983	In 1984-1986	No Plans	Don't Know	EDP Responsibility Now	In 1981-1983	In 1984-1986	No Plans	Don't Know
Intra-company electronic mail	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Communicating word processors	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Video conferencing – freeze frame	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Video conferencing – full motion	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Sub-minute facsimile	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Intra-building wideband facilities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Intra-city wideband facilities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dedicated satellite earth station	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Computerized PBX	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Automatic network management systems	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Worldwide data communications networks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Private packet transmission (X.25)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

L. QUESTIONNAIRE FOLLOW-UP

60. Would you be willing to discuss any of the issues covered in this questionnaire in further detail with a member of INPUT's professional staff? ☐ I want to discuss, or ☐ I am willing to discuss _____

_____ ☐ I do not wish, or have no reason, to pursue any issue further.

61. What topics or questions would you like to see included in future questionnaires, if you could receive a statistical summary of the responses? _____

_____

_____

THANK YOU FOR YOUR PARTICIPATION. YOUR GIFT WILL BE SENT SHORTLY.

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